



ADSTAR Distributed Storage Manager

# Using the UNIX Hierarchical Storage Management Clients

*Version 2*

**Note!**

Before using this information and the product it supports, be sure to read the general information under "Notices" on page vii.

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**First Edition (March 1996)**

This edition applies to Version 2 Release 1 of the ADSTAR Distributed Storage Manager, (5765-564) and (5655-119), and to any subsequent releases until otherwise indicated in new editions or technical newsletters. Make sure you are using the correct edition for the level of the product.

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## Preface

ADSTAR Distributed Storage Manager (ADSM) is a client/server program product that provides storage management services to customers in a multivendor computer environment. It includes the following programs:

- A *server program* that allows various systems to act as backup and archive servers for distributed workstations and file servers, and allows an MVS or AIX system to act as a migration server for distributed workstations and file servers. The server program provides hierarchical storage management.
- An *administrative client program* that allows an ADSM administrator to control and monitor server activities, define storage management policies for backup, archive, and space management services, and set up schedules to perform those services at regular intervals.
- A *backup-archive client program* that allows users to back up and archive files from their workstations or file servers to ADSM storage, and restore and retrieve backup versions of files and archived copies of files to their local file systems.
- A *hierarchical storage management (HSM) client program* that provides space management services. The HSM client program migrates eligible files to ADSM storage to maintain specific levels of free space on local file systems, and automatically recalls migrated files when they are accessed. It also allows users to migrate and recall specific files.
- An *application programming interface (API)* that allows customers to enhance an existing application with storage management services. When an application is registered as a client node with an ADSM server, users can use the application to back up and archive objects, such as databases, to ADSM storage, and restore and retrieve objects from ADSM storage.

This publication provides information about the ADSM hierarchical storage management client. The terms *hierarchical storage management* and *space management* are used synonymously throughout this publication.

---

## Who Should Read This Publication

This publication provides guidance and reference information for users of the ADSM HSM client with the following environments:

- IBM's AIX Version 3.2.3, 3.2.4, 3.2.5 or 4.1
- Sun Microsystems' Solaris Version 2.5

The HSM client must communicate with an ADSM Version 2 Release 1 Level 0.2/0.2 or higher server.

This publication includes instructions for a root user to set up and maintain the ADSM HSM client on your workstation. It also includes instructions for users to migrate and recall selected files and to display information about their file systems.

Information in this publication directed specifically to root users is identified by this icon:



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## What You Should Know Before Reading This Publication

This publication assumes that you know how to use your workstation, and that you understand the general operation of your operating system.

It also assumes that the ADSM HSM client is installed on your system. See *ADSTAR Distributed Storage Manager Installing the Clients* for information about installing the HSM client.

There are two versions of the HSM client: a graphical user interface (GUI) client and a command-line client. You might have both, or just one, installed. This book provides information for both clients.

For information about messages that are displayed by the HSM client, see *ADSTAR Distributed Storage Manager Messages*.

---

## Style Conventions

Throughout this book, we use these style conventions:

*Figure 1. Style Conventions*

Convention	Indicates
<b>bold</b>	<ul style="list-style-type: none"><li>• A command</li><li>• A directory name</li><li>• A file name</li><li>• A selectable graphical user interface object</li></ul>
UPPER CASE	An ADSM option
<i>italics</i>	A new term
monospace text	An example in the text
semicolon (;)	Separates a sequence of actions. You should do these actions one after the other. For example, click on the <b>Selected</b> menu; <b>Add Space Management</b> item means to select the <b>Selected</b> menu from the menu bar, and then select the <b>Add Space Management</b> item from that menu.

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## Referenced Publications

The publications referenced in this book are listed in Figure 2 on page xi.

All of the ADSM publications are available in online readable format on the *ADSM Online Product Library* CD-ROM, order number SK2T-1878. The ADSM library is also available on the following CD-ROMs:

- MVS Base Collection Kit* (order number SK2T-0710)
- VM Base Collection Kit* (order number SK2T-2067)
- OS/2 Base Collection Kit* (order number SK2T-2176)
- AIX Base Collection Kit* (order number SK2T-2066)
- AS/400 Base Collection Kit* (order number SK2T-2171)
- IBM SystemView for AIX* (order number SK2T-1451)

Figure 2. Referenced Publications

Short Title	Publication Title	Order Number
Using the UNIX Backup-Archive Clients	<i>ADSTAR Distributed Storage Manager Using the UNIX Backup-Archive Clients</i>	SH26-4052
Installing the Clients	<i>ADSTAR Distributed Storage Manager Installing the Clients</i>	SH26-4049
ADSM Messages	<i>ADSTAR Distributed Storage Manager Messages</i>	SH35-0133

## Translations

Selected ADSM publications have been translated into languages other than American English. The *ADSTAR Distributed Storage Manager: General Information*, GH35-0114, has a complete list of the available translations and their order numbers. Contact your IBM representative for more information about the translated publications and whether these translations are available in your country.



## Reading Syntax Diagrams

This section describes how to read the syntax diagrams used in this book.

To read a syntax diagram, follow the path of the line. Read from left to right and top to bottom.

- The  $\blacktriangleright$ — symbol indicates the beginning of a syntax diagram.
- The — $\blacktriangleright$  symbol at the end of a line indicates the syntax diagram continues on the next line.
- The  $\blacktriangleright$ — symbol at the beginning of a line indicates a syntax diagram continues from the previous line.
- The — $\blacktriangleleft$  symbol indicates the end of a syntax diagram.

Syntax items, such as a keyword or variable, can be:

- On the line (required element)
- Above the line (default element)
- Below the line (optional element).

Syntax Diagram Description	Example
<p><b>Abbreviations:</b></p> <p>Uppercase letters denote the shortest acceptable truncation. If an item appears entirely in uppercase letters, it cannot be truncated.</p> <p>You can type the item in any combination of uppercase or lowercase letters.</p> <p>In this example, you can enter KEYWO, KEYWORD, or KEYWOrd.</p>	<p><math>\blacktriangleright</math>—KEYWOrd—<math>\blacktriangleleft</math></p>
<p><b>Symbols:</b></p> <p>Enter these symbols exactly as they appear in the syntax diagram.</p>	<ul style="list-style-type: none"> <li>* Asterisk</li> <li>{ } Braces</li> <li>:</li> <li>,</li> <li>= Equal Sign</li> <li>- Hyphen</li> <li>() Parentheses</li> <li>.</li> <li>Space</li> </ul>
<p><b>Variables:</b></p> <p>Italicized lowercase items (<i>var_name</i>) denote variables.</p> <p>In this example, you can specify a <i>var_name</i> when you enter the KEYWORD command.</p>	<p><math>\blacktriangleright</math>—KEYWOrd—<i>var_name</i>—<math>\blacktriangleleft</math></p>

## Syntax Diagram Description

## Example

### Repetition:

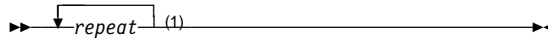
An arrow returning to the left means you can repeat the item.



A character within the arrow means you must separate repeated items with that character.



A footnote by the arrow references the number of times you can repeat the item.



### Note:

1 Specify *repeat* as many as 5 times.

### Required Choices:

When two or more items are in a stack and one of them is on the line, you *must* specify one item.



In this example, you *must* choose A, B, or C.

### Optional Choice:

When an item is below the line, that item is optional. In the first example, you can choose A or nothing at all.

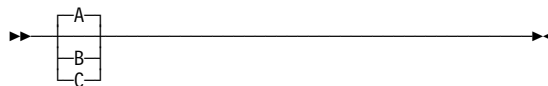


When two or more items are in a stack below the line, all of them are optional. In the second example, you can choose A, B, C, or nothing at all.



### Defaults:

Defaults are above the line. The default is selected unless you override it. You can override the default by including an option from the stack below the line.



In this example, A is the default. You can override A by choosing B or C. You can also specify the default explicitly.

### Repeatable Choices:

A stack of items followed by an arrow returning to the left means you can select more than one item or, in some cases, repeat a single item.



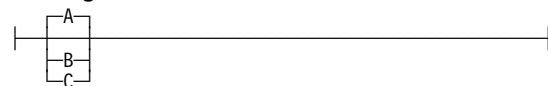
In this example, you can choose any combination of A, B, or C.

### Syntax Fragments:

Some diagrams, because of their length, must fragment the syntax. The fragment name appears between vertical bars in the diagram. The expanded fragment appears between vertical bars in the diagram after a heading with the same fragment name.



### The fragment name:



---

## Chapter 1. Introduction

ADSTAR Distributed Storage Manager (ADSM) provides a comprehensive storage management solution for workstations and file servers in a network environment. It includes backup, archive, and migration services.

---

### Understanding Backup, Archive, and Migration

The ADSM *backup-archive client* provides these services:

<b>Backup</b>	Provides data protection services  Backup makes successive copies of your files that you can restore if the original files are accidentally deleted, corrupted, or lost due to a hardware failure.
<b>Archive</b>	Provides data retention services  Archive makes essentially permanent copies of your files that you can keep indefinitely. You can delete the original files from your local file systems, and retrieve archived copies when you need them.

The ADSM *hierarchical storage management client* provides this service:

<b>Migration</b>	Provides space management services  Migration automatically moves infrequently-used or large files to distributed storage devices through an ADSM server to free space on your local file systems. Stub files, which contain the information necessary to recall migrated files, are left on your local file systems so that the files appear to reside locally (for example, migrated files are listed by the <b>ls</b> command). Files are recalled back to your local file systems automatically when they are accessed. No user intervention is necessary, although you can choose to migrate or recall selected files.
------------------	---

While backup, archive, and migration provide similar services in some respects, each meets specific needs for your data.

The following sections provide some comparisons of the various services. For more detailed information about using backup and archive services, see *ADSTAR Distributed Storage Manager Using the UNIX Backup-Archive Clients*.

### Do You Want to Back Up or Archive Files?

When ADSM backs up or archives a file, it sends a copy of the file and its associated attributes to an ADSM server. However, backups and archives have different purposes.

Backups are used to protect against file damage or loss. A sequence of backup versions are kept for each file on your workstation (the number of versions is set by your ADSM administrator), and older versions are deleted as newer versions are made.

Archives, however, are more permanent. An archived copy of a file is used to maintain the file in a particular state indefinitely (although your administrator also sets a limit on how long archives are kept). An archived copy is useful if you think you might need to go back to a particular version of a file, or if you want to delete a file from your workstation and still be able to retrieve it if necessary. For example, you might need to save some spreadsheets for tax purposes, but because you are not using them, you do not want them left on your workstation.

Use backups to protect against unforeseen damage to your files, and archives to maintain more permanent versions of your files.

## **Do You Want to Archive or Migrate Files?**

You can use both archive and migration to free space on your local file systems. However, there are instances where it is more efficient to use one service instead of the other. The following sections provide some examples.

### **Providing Continuous Space Management**

For continuous space management, ADSM migrates and recalls files automatically as needed. A root user on your workstation can set options and space management settings to obtain optimal results. The options and settings determine which files are eligible for automatic migration, the order in which files are migrated, where the migrated files are stored, and how much free space is maintained on a local file system.

Allowing ADSM to migrate files automatically, saves you the time it would take to decide which files to archive and delete from your local file systems, and the time it would take to initiate archive operations yourself.

### **Working with Large Groups of Files**

Because migrated files are designed to appear as though they reside locally, migration and recall are highly integrated with the operations of your operating system. Therefore, when files are migrated or recalled, ADSM must process them individually.

You can migrate and recall selected files. However, you should use that method of manually storing and accessing files only when you are working with a small number of files or for special situations where you want to recall one or more migrated files before you begin working with them.

For planned processes, such as storing a large group of files in ADSM storage and bringing them back to a local file system all at once for processing, you should use archive and retrieve.

For example, if you have a large number of files that are updated only once a week or once a month by a particular program, you can archive those files to save space on your local file system. Then, when you need to update the files, you can retrieve them



all at one time. To simplify the process, your ADSM administrator can set up a schedule to retrieve all of the files at a particular time, and then archive them after they are updated.

Using that method of storing and accessing a large number of files at one time is more efficient than selectively migrating and recalling the files or allowing the files to be migrated and then automatically recalled one at a time when they are accessed by a program that updates them.

### **Do You Want to Migrate or Back Up Files?**

Migration is not a replacement for backup. Migration only frees space on your local file systems. Unlike file backup, it does not protect against accidental file deletion, file corruption, or disk failure.

You should continue to back up all of your important files whether they reside on your local file system or are migrated to ADSM storage.

For detailed information about backing up and restoring migrated files, see Chapter 6, “Backing Up and Restoring Migrated and Premigrated Files” on page 85.

---

## **Understanding Hierarchical Storage Management**

With ADSM hierarchical storage management (HSM), new files and the files you use most frequently remain on your local file systems, while those you use less often are automatically migrated to distributed storage devices through an ADSM server. You can also specify that files be prioritized for migration based on their size, or based on both the number of days since they were last accessed and their size.

By migrating eligible files to distributed storage devices, HSM frees space for new data on your local file systems and takes advantage of lower cost storage resources available in your network environment.

Files migrated to ADSM storage are easily accessible. When you access a migrated file, HSM automatically recalls it back to your local file system. If you choose, HSM can recall a migrated file temporarily. If you do not modify the file, HSM automatically changes it back to a migrated file when you close it. You can also choose to have HSM read a migrated file from ADSM storage without storing it back on your local file system.

HSM ensures the integrity of your data and provides the same level of security for migrated files as that provided by your operating system file systems. It works hand-in-hand with your operating system file system to provide advanced hierarchical storage management services, while maintaining optimal file system performance.

The following sections provide more detail about HSM services.

## Migrating Files From a Local File System

To migrate a file, HSM sends a copy of the file to an ADSM server and replaces the original file with a stub file on the local file system. It does not change the access time (atime) or permissions for the file.

The ADSM server places the file in ADSM storage. ADSM storage consists of storage volumes on disk devices or devices that support removable media such as tape. The storage volumes are defined and grouped into storage pools by your ADSM administrator.

A *stub file* is a small file that contains the information required to locate and recall a migrated file. It also makes it appear as though the file still resides on your local file system. In addition, a stub file contains information that HSM can use to respond to specific UNIX commands, such as **ls**, without recalling the file.

HSM provides space management services for locally mounted file systems. It migrates only regular files. It does not migrate character special files, block special files, FIFO special files (named pipe files), or directories.

HSM provides both automatic and selective migration. The following sections discuss each type.

### Automatic Migration

To ensure that free space is available on your local file systems, HSM monitors space usage and automatically migrates files whenever necessary.

It migrates only files that are eligible for automatic migration based on space management options and settings chosen by a root user on your workstation. The primary requirement for eligibility is based on the number of days since a file was last accessed.

HSM provides two types of automatic migration:

**Threshold migration** Maintains a specific level of free space on a local file system.

HSM checks space usage on your local file systems at the intervals specified by a root user. For example, the default interval is every five minutes. When space usage reaches the *high threshold* set for a file system, HSM automatically begins migrating eligible files to ADSM storage. When space usage drops to the *low threshold* set for a file system, HSM stops migrating files.

A root user can also start threshold migration for a file system before space usage reaches the high threshold. If space usage exceeds the low threshold set for the file system when a root user starts threshold migration manually, HSM migrates eligible files until space usage drops to the low threshold.

**Demand migration** Responds to an out-of-space condition on a local file system. HSM checks for an out-of-space condition every two seconds. If a file system runs out of space, HSM automatically starts threshold migration. As files are migrated, space becomes available on the file system, and the process that caused the out-of-space condition can continue. The process does not need to wait until threshold migration is complete, and you do not receive an out-of-space error message.

The following are examples of how threshold migration and demand migration work:

- If a root user sets the high threshold for a file system to 80 percent and the low threshold to 70 percent:
  - HSM begins migrating files to ADSM storage whenever there is 20 percent or less free space available on the file system. On a 100-MB file system, it would begin migrating files when there are 20 MB or less available.
  - HSM stops migrating files when there is 30 percent or more free space available on the file system. On a 100-MB file system, it would stop migrating files when there are at least 30 MB of free space available.
- If you attempt to copy a very large file into one of your file systems, and there is not enough space available to hold the entire file, HSM automatically begins migrating eligible files from the local file system to ADSM storage. As space becomes available, the process can continue copying the file to the file system.

### Selective Migration

You can use *selective migration* to move specific files from a local file system to ADSM storage.

For example, if you know you will not be using a particular group of files for an extended period of time, you can choose to migrate them to ADSM storage right away to free additional space on a local file system.

HSM migrates only files that are eligible for selective migration based on space management options and settings chosen by a root user on your workstation. For example, a file must be at least the minimum size required for migration eligibility. However, unlike automatic migration, the number of days since a file was last accessed has no effect on whether the file is eligible for selective migration.

If you are a root user, you can selectively migrate all files on your workstation that are eligible for selective migration. If you are a user, you can selectively migrate any file you own that is eligible for selective migration.

### Premigrating Files for a Local File System

To make migration faster, HSM prepares files for automatic migration using a process called *premigration*. To premigrate a file, HSM copies the file to ADSM storage, and leaves the original file intact on the local file system. An identical copy of the file resides both on the local file system and in ADSM storage.

The next time free space is needed on the file system, HSM can quickly change premigrated files to migrated files without requiring the time necessary to copy the files to ADSM storage. HSM verifies that the files have not changed since they were premigrated, and replaces the copies of the files on the local file system with stub files.

HSM premigrates files each time it completes automatic migration if the file system contains additional files that are eligible for automatic migration, and the premigration percentage set for the file system has not been reached or exceeded.

The *premigration percentage* indicates the percentage of space on a file system that you want to contain premigrated files that are the next eligible candidates for migration. The default for the premigration percentage is the difference between the percentage set for the high threshold and the percentage set for the low threshold for the file system. However, a root user can adjust the premigration percentage at any time.

## Recalling Migrated Files

To bring a migrated file back to your workstation or file server, HSM recalls the file from ADSM storage. Whenever HSM recalls a file back to a local file system, it changes the access time (*atime*) for the file to the current time (unless the timestamp control mode, discussed in “Modifying the HSM-Related Behavior of Commands” on page 12, is set to preserve the last access time recorded for the file).

HSM provides both transparent and selective recall. The following sections discuss each type.

### Transparent Recall

To access a migrated file, you do not need to be aware that the file is migrated. You access it in the same way as you access a file that resides on a local file system. *Transparent recall* brings a migrated file back to your local file system automatically when the file is accessed.

When you access a migrated file, HSM automatically recalls it back to its *originating file system* (the file system from which the file was migrated). A root user sets an option (the *KERNELMESSAGES* option) that determines whether HSM notifies you when a file is being recalled. However, whether a file resides on a local file system or has been migrated to ADSM storage is transparent to any process that accesses the file.

When HSM recalls a migrated file, it leaves a copy of the file in ADSM storage. Because an identical copy of the file resides both on the local file system and in ADSM storage, the file is in a premigrated state. The file remains premigrated until it once again becomes eligible for migration and is changed to a migrated state, or you modify the file. If you modify the file, it becomes a resident file.

### Selective Recall

Although a migrated file appears to reside on your local file system, you can find out whether a file is migrated by using the HSM graphical user interface or HSM commands to display information about your files.

If you want to bring specific migrated files back to your local file system, you can use *selective recall*.

For example, if you plan to use a group of files that you know are migrated, you can request that HSM recall them to your local file system.

When you selectively recall a group of files, HSM recalls them in the most efficient, time-saving order based on where they are stored in ADSM storage. For example, if some of the files are stored on a disk storage device and some are stored on a tape storage device, HSM recalls all of the files on the disk storage device first, and then recalls all of the files stored on the tape storage device.

If you are a root user, you can selectively recall any file migrated from your workstation. If you are a user, you can selectively recall any migrated file you have permission to access. When you selectively recall a file, HSM stores it back on its originating file system.

## Using Advanced Transparent Recall

For special situations, you can choose to take advantage of HSM's advanced transparent recall features. By changing the *recall mode* for a migrated file or a specific execution of a command, you can change how HSM recalls a migrated file.

In addition to the normal recall mode (which causes HSM to recall a migrated file back to its originating file system), HSM provides these recall modes:

- |                            |  |
|----------------------------|--|
| <b>Migrate-on-close</b>    | Recalls a migrated file back to its originating file system only temporarily. The recalled file remains on your local file system only for as long as it is open. When you close the file, if it has not been modified, HSM replaces it with a stub file on the local file system, and it once again becomes a migrated file. HSM does not need to send a copy of the file to ADSM storage because the file has not been modified, and the copy that currently resides in ADSM storage is still valid. |
| <b>Read-without-recall</b> | Reads a migrated file from ADSM storage without storing it back on your local file system at all. HSM reads information from the migrated file sequentially, and caches information read from the file in a memory buffer on your workstation.   |

HSM can use the migrate-on-close and read-without-recall modes only under certain conditions. The following sections provide more information about those conditions.

In addition, you should not use the migrate-on-close or read-without-recall modes for a file migrated from a file system that has been exported by an NFS server. Because NFS opens and closes a file many times when it is accessed by an NFS client, performance can be severely hampered.

Also note that selective recall overrides the recall mode for a migrated file if the recall mode is set to migrate-on-close or read-without-recall. You can selectively recall a migrated file regardless of its recall mode.

For detailed information about changing recall modes, see:

- “dsmattr — Setting or Displaying the Recall Modes for Migrated Files” on page 106
- “dsmmode — Setting or Displaying Execution Modes” on page 143

### Using Migrate-on-close Mode

You can set the recall mode to migrate-on-close for migrated files that are normally read, but not modified. Or, you can set the recall mode to migrate-on-close for processes that read files, but do not modify them.

HSM can use the migrate-on-close mode to recall a file temporarily if:

- The recall mode set for a migrated file is migrate-on-close, and the file is accessed only by processes that do *not* modify the file.
- The recall mode set for a migrated file is normal, but *all* processes that access the file at one time use the migrate-on-close recall mode and do *not* modify the file.

If the recall mode set for a file is migrate-on-close, and the file is modified by any process, the file remains on your local file system. If the recall mode set for a file is normal, and it is accessed by processes that use the migrate-on-close mode, but at least one process accesses it at the same time using normal recall mode or accesses and modifies it, the file remains on your local file system.

### Using Read-without-recall Mode

HSM can use the read-without-recall mode to read a migrated file without storing it on your local file system only when:

- The recall mode set for a file is read-without-recall, and *all* processes that access the file at one time do *not* modify the file and do *not* use memory mapping. Most Solaris shell commands such as *file*, *cat*, *tail*, *cp* use memory mapping i/o on the source file. HSM automatically recalls a file using memory mapping i/o to a resident state. Therefore, if you using a Solaris shell command to access a read-without-recall mode file, the file will always be recalled to a resident state.  
  
A program doing simple open, read or close will leave read-without-recall mode file in a migrated state.
- The recall mode set for a file is read-without-recall, and if the file is a binary executable file, the process does not execute it.

If a process that accesses the file writes to the file, modifies the file, or uses memory mapping, HSM recalls the file back to its originating file system. In addition, if the file is a binary executable file, and it is executed, HSM recalls it back to its originating file system. (If you want a file to be returned to a migrated state after it is executed, you can set the recall mode for a process that executes it to migrate-on-close.)

### Attention

When the recall mode set for a file is read-without-recall, multiple processes can access the file at one time, and a process can seek backward in the file. However, the read-without-recall mode is intended for single access, sequential reads of non-executable files. Accessing the file with multiple processes at one time or seeking backward in the file can significantly affect the performance of each process that is accessing the file.

## Reconciling Your File Systems

To keep your local file systems synchronized with the ADSM server you contact for space management services, HSM uses *reconciliation*. Reconciliation also keeps the migration candidates list for each of your file systems up to date.

HSM automatically reconciles your file systems at intervals set by a root user on your workstation. For example, the default interval is every 24 hours. A root user can also run reconciliation at any time.

The following sections discuss these topics:

- Synchronizing your client and server
- Building a new migration candidates list

### Synchronizing Your Client and Server

When you access and modify a migrated or premigrated file or erase a migrated or premigrated file from a local file system, an outdated copy of the file still exists in ADSM storage.

During reconciliation, ADSM marks any outdated copies of migrated or premigrated files for expiration. The copies expire and are removed from the server after the expiration period specified by a root user has elapsed.

When synchronizing a file system, HSM also updates other space management related information. For detailed information about other tasks HSM performs, see “Starting Reconciliation Manually” on page 55.

### Building a New Migration Candidates List

A *migration candidates list* is a prioritized list of all files in a file system that are eligible for automatic migration at the time the list is built. HSM uses that list to determine which files to migrate and the order in which to migrate them during threshold and demand migration.

HSM builds a new migration candidates list each time reconciliation is run. If the migration candidates list for a file system does not exist or is empty when automatic migration is needed, HSM runs reconciliation to attempt to build one at that time. In addition, a root user can build a new migration candidates list at any time.

To be eligible for automatic migration, a file must:

- Reside in a file system to which space management has been added
- Meet all management class requirements for eligibility
- Be at least the minimum size required for migration

In addition, it must not be excluded from space management services.

HSM prioritizes files for migration based on the number of days since they were last accessed, their size, and the age and size factors set for the file system by a root user on your workstation. The *age factor* determines how much weight is given to the number of days since a file was last accessed, and the *size factor* determines how much weight is given to a file's size.

## Setting Space Management Options

A root user sets space management options for your workstation that determine:

- How often HSM checks space usage on your file systems
- The ADSM server to which your files are migrated and premigrated
- How often HSM automatically reconciles your file systems
- How many days must elapse since a migrated or premigrated file was deleted or modified on the local file system before the copy in ADSM storage expires and is removed

A root user sets those options, along with other space management and ADSM options, in your *client system options file*. For more detailed information about setting options in your client system options file, see “Setting Space Management Options” on page 21.

In addition, a root user can set options to:

- Exclude specific files from space management services
- Assign specific management classes to files

## Excluding Files from Space Management

Some files, such as system files and files created by and used for HSM processing, should not be migrated from a local file system. HSM automatically excludes those files from space management.

You may also have some additional files that you want to keep on your local file systems at all times. A root user can set options to exclude specific files or groups of files from all space management services in your *include-exclude options file*.

For more detailed information about excluding files from space management, see “Excluding Files From Space Management” on page 27.

## Assigning Management Classes to Files

The *management class* assigned to a file determines:

- Whether HSM can migrate the file automatically and by user request, by user request only, or neither



- The number of days that must elapse since the file was last accessed before it is eligible for automatic migration
- Whether a current backup version of the file (created using the ADSM backup-archive client) must exist on your migration server before the file is eligible for migration
- Where the file is stored when it is migrated

ADSM provides a *default management class* that you can use for some or all of your files. A root user can also assign different management classes to specific files by setting options in your include-exclude options file.

Your ADSM administrator defines the management classes from which a root user can choose. For example, your administrator can define a management class that allows a file to be migrated to ADSM storage automatically if it has not been accessed for at least 30 days, and a current backup version of the file exists on your migration server. Or, your administrator can define a management class that allows you to selectively migrate a file regardless of whether a current backup version of the file exists on your migration server.

For more detailed information about assigning management classes to files, see “Assigning Management Classes to Files” on page 29.

## Choosing Space Management Settings

A root user must also add space management to each file system for which you want space management services. When adding space management to a file system, the root user chooses *space management settings* that determine:

- The high and low thresholds for the file system
 

The high and low thresholds determine when HSM automatically starts and stops threshold migration.
- The size of the stub files left on the file system when files are migrated
 

The *stub file size* determines how many leading bytes of data from a migrated file HSM can store in a stub file. If only that data is accessed and is not modified, HSM does not need to recall the file from ADSM storage.

The stub file size also determines the minimum size a file must be before it is eligible for migration. To be eligible for migration, a file's size must be greater than both the stub file size plus one byte and the block size defined for the file system.
- The order in which eligible files are automatically migrated from the file system
 

A root user can choose settings that determine whether HSM prioritizes files for automatic migration based on the number of days since they were last accessed, their size, or a combination of both.
- The total number of megabytes of data that can be migrated and premigrated from the file system to ADSM storage

This number is called a *quota*. The default is the same number of megabytes allocated for the file system itself. For example, if 200 MB are allocated to a file system, ADSM can migrate and premigrate files from the file system until the total number of megabytes migrated and premigrated equals 200 MB.

A root user can increase or decrease the quota to accommodate the growth of a file system or to adhere to any restrictions placed on space usage by your ADSM administrator.

For more detailed information about space management settings, see “Choosing Space Management Settings” on page 39.

## Modifying the HSM-Related Behavior of Commands

Normally, most commands, such as those provided by your operating system, can access migrated files, cause the access time (*atime*) for a file to be updated, and cause a migrated file to be recalled. In addition, if a command causes a local file system to run out of space during processing, HSM normally intercepts the out-of-space condition and begins automatic migration.

HSM allows you to modify those behaviors for a specific execution of a command or series of commands by changing the *execution modes* that are in effect.

For example, if you want to prevent a command, such as the **grep** command, from accessing migrated files, you can change the *data access control mode* before issuing that command.

To prevent a command, such as a utility that creates backup versions of files, from updating access times, a root user can change the *timestamp control mode*.

If you want to prevent HSM from intercepting an out-of-space condition caused by a command, you can change the *out-of-space protection mode* before issuing the command, and if, as previously discussed, you want HSM to change a recalled file back to a migrated file if it is not modified, you can change the *recall mode* for a command to *migrate-on-close*.

For detailed information about changing execution modes, see “*dsmmode* — Setting or Displaying Execution Modes” on page 143.

**Note:** When you back up or archive a file using the ADSM backup-archive client, the access time for a file remains unchanged. A root user does not need to change the time-stamp control mode.

## Scheduling Space Management Services

ADSM provides *central scheduling* that allows your ADSM administrator to schedule ADSM services. For example, if you are using the ADSM backup-archive client on your workstation, your administrator can schedule regular incremental backups of your files.

Although HSM automatically performs most space management services based on options and settings selected by a root user on your workstation, your administrator can

choose to schedule space management services, such as threshold migration or reconciliation, to occur at specific times.

Before ADSM can perform scheduled services, a root user on your workstation must set scheduling options in your client system options file (if the defaults for those options are not appropriate) and start a client scheduler on your workstation.

For more detailed information about scheduling space management services, see “Setting Up Central Scheduling” on page 63.

In addition, a root user can set up a **cron** job to run space management services at specific times. For example, a root user can set the RECONCILEINTERVAL option in your client system options file to 0 so that HSM does not automatically reconcile file systems at specific intervals. Then, the root user can use a **cron** job to run reconciliation at a specific time each day.

## **Backing Up and Restoring Migrated Files**

You can back up and restore migrated files using the ADSM backup-archive client in the same way as you back up and restore files that reside on your local file system.

In addition, if stub files are accidentally deleted from a local file system, or if you lose an entire local file system, you can restore stub files for migrated files.

For detailed information, see Chapter 6, “Backing Up and Restoring Migrated and Pre-migrated Files” on page 85.

## **Archiving and Retrieving Copies of Migrated Files**

You can archive and retrieve copies of migrated files using the ADSM backup-archive client in the same way as you archive and retrieve copies of files that reside on a local file system.

For detailed information, see Chapter 7, “Archiving and Retrieving Migrated and Pre-migrated Files” on page 99.



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## Chapter 2. Getting Started

Before you can begin setting up and using HSM, it must be installed on your workstation, and your workstation must be registered as a client node with an ADSM server. For instructions to install the ADSM HSM client program and instructions to register your workstation, see *ADSTAR Distributed Storage Manager Installing the Clients*.

HSM performs most space management tasks automatically. However, to perform setup and maintenance tasks and optional tasks (such as displaying information about local file systems and migrating and recalling selected files), HSM provides a graphical user interface and HSM commands.

You can use the graphical user interface to perform most space management tasks. However, if you prefer to use HSM commands, or if you need to perform a task that can be performed only with a command (such as changing a recall or execution mode) see Chapter 8, "Using Commands" on page 101 for detailed information about each command. To display online help for commands, enter **dsmmighelp** on the command line.

---

### Starting Hierarchical Storage Management

#### Starting the X Window System

Before you can start the ADSM HSM graphical user interface, the X Window System must be running on your workstation. If the X Window System is not running on your workstation, start it as follows:

On an AIX workstation, enter **xinit**

On a Sun Solaris workstation, enter **openwin**

If the X Window System is running, check to see whether an ADSM HSM session is already started. If a session is started, this icon appears on your workstation desktop:



If the ADSM HSM icon appears on your workstation desktop, double-click on the icon to open the ADSM Hierarchical Storage Management window.

If the ADSM HSM icon does not appear on your workstation desktop, enter the following command:

**dsmhsm**

The ADSM Hierarchical Storage Management window shown in Figure 3 on page 16 appears.

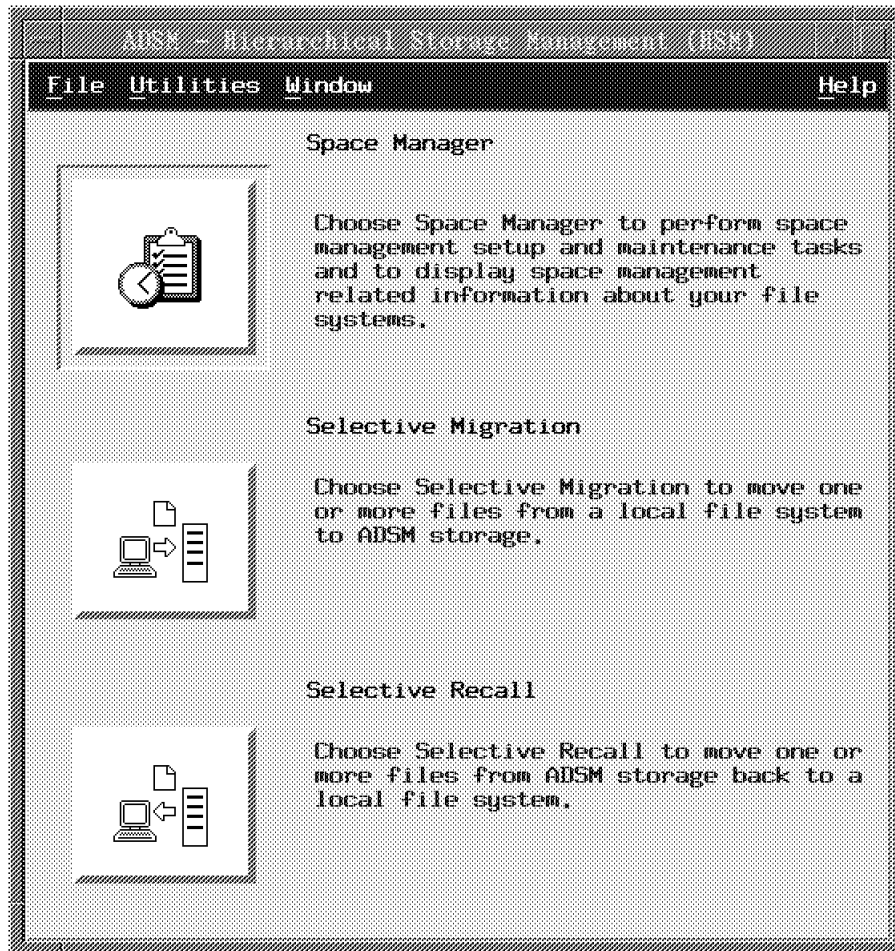


Figure 3. ADSM Hierarchical Storage Management Window

On the ADSM Hierarchical Storage Management window, you can select the following push buttons:

**Space Manager**—Select this push button if you want to perform any of these tasks:

*Root User Only*

- Add space management to a file system
- Update space management settings
- Deactivate space management for a file system
- Reactivate space management for a file system
- Remove space management from a file system

- Globally deactivate space management
- Globally reactivate space management
- Start threshold migration manually
- Reconcile a file system
- Synchronize client and server
- Build a new migration candidates list

*User or Root User*

- Display information about file systems
- Display a migration candidates list

**Selective Migration**—Select this push button if you want to select a specific file or group of files to migrate to ADSM storage.

**Selective Recall**—Select this push button if you want to select a specific file or group of files to recall from ADSM storage back to a local file system.

On any window that contains a menu bar, you can also select options from the **Utilities** menu to perform these tasks:

*Root User Only*

- Change your ADSM password

*User or Root User*

- Display information about management classes
- Display information about client and server options

**Note:** If you are logged in as a regular user, menu items that can be selected only by a root user appear in a lighter shade. You cannot select those menu items.

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## Ending Hierarchical Storage Management

To end a session with ADSM HSM, click on the **File** menu; **Exit** item in any ADSM HSM window that contains a menu bar.

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## Using a Mouse

A mouse works with HSM in the same way it works with other standard applications.

Throughout this publication, the term *click* means to press and release mouse button 1 (usually the left mouse button). For example, “click on **OK**” means to move the mouse pointer to the button labeled **OK**, and then press and release the left mouse button. Releasing the mouse button initiates the action associated with the **OK** button.

The term *select* means to choose an item from a list or group of items. Usually, the item is highlighted to show that you have selected it.

For example, you select a menu by moving the mouse pointer over the menu name and holding mouse button 1 down. While the mouse button is down, a pop-up menu appears.

Next, you select a menu item by moving the mouse pointer over the item in the menu. The item is highlighted. You initiate the action associated with the menu item by releasing the mouse button.

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## Displaying Online Help Information

Most of the information in this publication is available in online help. The following sections provide instructions to display different types of information.

### Task Help

Provides step-by-step instructions to perform specific tasks. To display task help, do one of the following:

- Click on the **Help** menu; **Task Help** item in any window that contains a menu bar.
- Click on a hypertext link to the Task list from any help topic where that link is available.

### Window Help

Provides general information about using an active ADSM HSM window. You can also display information about display-only fields.

To display window help, do one of the following:

- Click on the **Help** menu; **Window Help** item in any window that contains a menu bar.
- Click on the **Help** push button in any dialog window where that button is available.

### Keyboard Help

Provides shortcut key combinations to perform frequently-used ADSM HSM functions.

To display keyboard help, click on the **Help** menu; **Keyboard Help** item in any window that contains a menu bar.

### Index

Displays an index for all the information contained in online help.

To display the Help Index, click on the **Help** menu; **Index** item in any window that contains a menu bar.

### Using Help

Provides instructions to use ADSM HSM help. To display those instructions, click on the **Help** menu; **Using Help** item in any window that contains a menu bar.

### Search

Allows you to search for online help information by topic or by keyword.



To display the Topic Search Dialog, click on the **Help** menu; **Search** item in any window that contains a menu bar.

### **Context-sensitive Help**

Provides information about any selectable object, such as an input field or push button, in an ADSM HSM window. To display context-sensitive help, do one of the following:

- Click on the **Help** menu; **Context-sensitive Help** item in any window that contains a menu bar. The cursor changes into a question mark (?). Move the question mark to a selectable object or field, and then click the left mouse button.
- Position the cursor on a selectable field or object, and then press **F1** or press the **Help** key if your keyboard has one.

### **View Books**

Starts an online book reader program that you can use to read this book and other books in the ADSM library. If this feature is available on your system, you or your administrator must install the reader and the books on a disk accessible to your system and set the BOOKS option in your client user options file. For information about installing the reader and the books, and instructions for setting the BOOKS option, see *ADSTAR Distributed Storage Manager Installing the Clients*.

To display an ADSM book, click on the **Help** menu; **View Books** item in any window that contains a menu bar.

### **Using Hypertext Links**

Hypertext links appear throughout ADSM HSM online help information. Hypertext links are highlighted words or phrases that allow you to display additional information about a topic.

To display additional information, such as a definition of a term or instructions to perform a task, click on a highlighted word or phrase.

### **Using the Help Viewer**

Whenever you request online help, ADSM displays the requested information in a separate window called a Help Viewer. Figure 4 on page 20 shows a sample Help Viewer window.

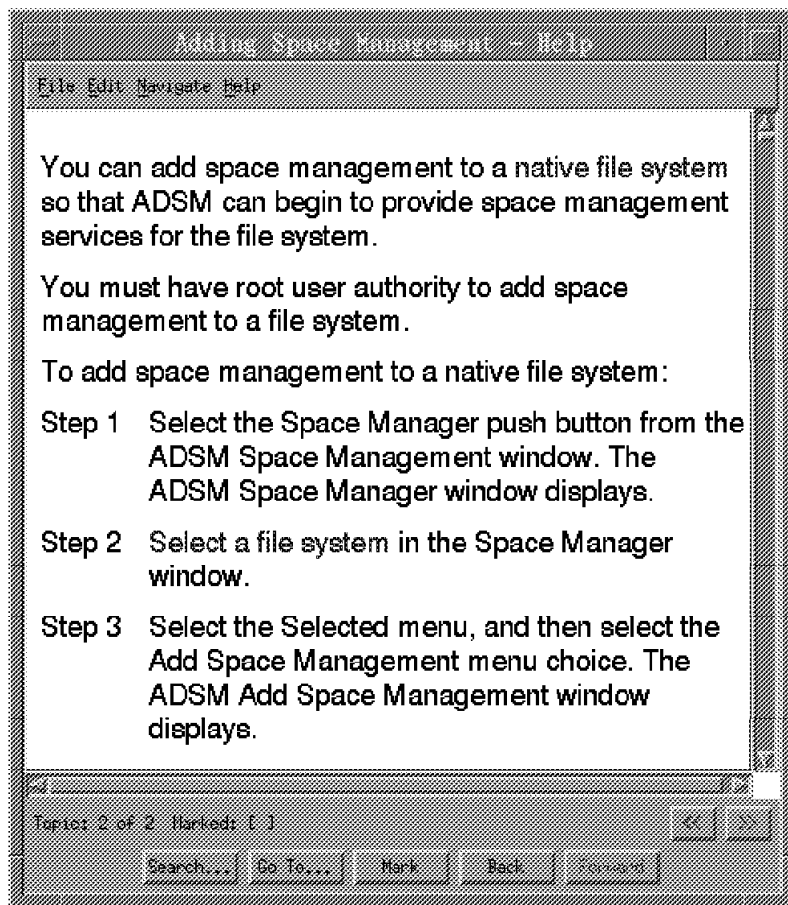


Figure 4. Sample Help Viewer Window

The ADSM Help Viewer provides push buttons and menu choices that allow you to:

- Search for information by topic or keyword
- Go to the Help Index, Glossary, Contents, Keyboard Help, or a bookmark
- Create bookmarks that allow you to return to a specific help panel
- Go backward or forward to previously displayed help information
- Go backward or forward sequentially through help topics

You can also click on menu items to copy a help topic, annotate a help topic, and display instructions for using help.

For more information about using the ADSM Help Viewer, click on the **Help** menu; **Using Help** item in any window that contains a menu bar, and then click on the **How to use a help window** hypertext link.

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## Chapter 3. Setting Up and Maintaining Space Management

Root User

This chapter contains information about setting up and maintaining space management for your local file systems. To perform the tasks described in this chapter, you must have root user authority.

The tasks described in this chapter include:

- Setting up space management
- Managing your file systems
- Starting threshold migration manually
- Starting reconciliation manually
- Starting the space monitor daemon
- Starting a recall daemon
- Setting up central scheduling
- Changing your ADSM password

---

### Setting Up Space Management

To set up space management, you perform the following tasks:

- Set space management options in your client system options file (**dsm.sys**) and your default client user options file (**dsm.opt**)
- Set options in an include-exclude options file to exclude specific files from space management and assign specific management classes to files (optional)
- Ensure that all file systems you want HSM to manage are mounted
- Add space management to each file system you want HSM to manage
- Choose space management settings for each file system to which you add space management

After you set up space management, you must ensure that all file systems managed by HSM are mounted either automatically or manually each time you reboot your system.

The following sections discuss or provide instructions to perform each of the setup tasks.

### Setting Space Management Options

HSM provides space management options that you can set in your *client system options file*. A client system options file also contains required communication options, and can contain authorization, central scheduling, backup and archive, and other options for your ADSM client node. The values you set for space management options determine which ADSM server your client node contacts for space management services and affect automatic migration, reconciliation, and recall.

HSM also provides an option you can set in your *client user options file* that affects how users can enter commands.

## Client System Options

Figure 5 provides a brief description of each space management option you can set in your client system options file.

For detailed information about setting space management options, communication options, and other ADSM options in your client system options file, see *ADSTAR Distributed Storage Manager Installing the Clients*.

Figure 5 (Page 1 of 2). Space Management Options Set in Your Client System Options File

Option	Description	Default
CHECKTHRESHOLDS	Determines how often HSM checks space usage on the file systems to which you add space management.	Every 5 minutes
DEFAULTSERVER	Specifies the ADSM server to which ADSM backs up and archives files from your local file systems by default, and, if the MIGRATESERVER option is not specified, the ADSM server to which HSM migrates files from your local file systems.	The server specified in the first stanza of the <b>dsm.sys</b> file
ERRORPROG	Specifies a program to which HSM sends a message if a severe error occurs during HSM processing.	None
KERNELMESSAGES	Determines whether HSM-related messages issued by the kernel are displayed.	Yes
MAXRECALLDAEMONS	Determines the maximum number of recall daemons that can run at one time. The minimum value you can specify for this option is 2.	20
MAXRECONCILEPROC	Determines the maximum number of file systems HSM can reconcile automatically at one time.	3
MAXTHRESHOLDPROC	Determines the maximum number of file systems for which HSM can perform automatic threshold migration at one time.	3
MIGFILEEXPIRATION	Determines the number of days a migrated or premigrated file remains in ADSM storage after it is modified on the local file system or erased from the local file system.	7 days

Figure 5 (Page 2 of 2). Space Management Options Set in Your Client System Options File

Option	Description	Default
MIGRATESERVER	Specifies the ADSM server to which HSM migrates files from your local file systems. If specified, overrides the DEFAULTSERVER option for migrated files only.	The server specified with the DEFAULTSERVER option, or if that option is not specified, the server specified in the first stanza of the <b>dsm.sys</b> file.
MINRECALLDAEMONS	Determines the minimum number of recall daemons to retain.	3
RECONCILEINTERVAL	Determines how often HSM automatically reconciles the file systems to which you add space management.	Every 24 hours

In your client system options file, you group options into stanzas for each ADSM server your client node contacts for backup, archive, and space management services.

All of the space management options except the ERRORPROG option must be placed *before* the stanzas for each ADSM server defined in your client system options file. For example, if you want to specify a default server for backup and archive services, a migration server, and new values for other space management options, you can place the options in your client system options file as shown in Figure 6 on page 24.

```

DEFAULTServer          server1
MIGRATEServer         server2
CHECKthresholds       2
RECONcileinterval     12
MAXRECONcileproc      5
MAXThresholdproc      5
MIGFILEEXpiration    10
MINRECALLdaemons     5
MAXRECALLdaemons     15
KERNELmessages        no

Servername            server1
  COMMmethod          TCPip
  TCPport             1500
  TCPserveraddress    almvmd.almaden.ibm.com
  Passwordaccess      generate
  Mailprog            /usr/bin/xsend root
  Groups              system adsm
  Users               steiner chron wang nguyen
  Inclexc1            /adm/adsm/backup.exc1
  ERRORprog          /bin/cat

Servername            server2
  COMMmethod          SNA1u6.2
  PARTnerluname       raptor
  TPname              appcdel
  CPICM0dename        appc
  Passwordaccess      generate
  Mailprog            /usr/bin/xsend root
  Groups              system adsm
  Users               sullivan tang schaefer
  Inclexc1            /adm/adsm/migrate.exc1
  ERRORprog          /bin/cat

```

Figure 6. Sample Client System Options File

You set space management options when you install and set up ADSM on your workstation or file server. You can also modify space management options later. However, there are special considerations for modifying server options, modifying options that are used by space management daemons, and modifying the KERNELMESSAGES option.

**Modifying Server Options:** You can migrate files from your workstation to only one ADSM server. After HSM begins migrating files to ADSM storage, modify the options you use to specify which server your client node contacts for space management services only if your ADSM administrator exports your migrated files from one server and imports them to another. Otherwise, ADSM will not be able to locate your migrated files until you change the options to point to the appropriate server.

You can specify which server to contact for space management services using the following options:

- **MIGRATESERVER**—Specifies the name of the server to contact for space management services. The server must be defined in a stanza in your client system options file.

Users cannot override the migration server by using the SERVERNAME option in a client user options file or with a command.

- **DEFAULTSERVER**—Specifies the name of the server to contact by default for backup and archive services. It also specifies which server to use for space management services if a server is not specified with the MIGRATESERVER option.

Users can override the default server by using the SERVERNAME option in a client user options file or with a command for backup and archive services, but cannot override the default server for space management services.

If you do not specify a server with the MIGRATESERVER option or the DEFAULTSERVER option, ADSM contacts the server specified in the first stanza of your client system options file for space management services and for backup-archive services by default. Users can override the default server for backup-archive services, but not for space management services.

**Modifying Options Used by Space Management Daemons:** There are several options you can modify that are used by space management daemons. Those options are:

```
CHECKTHRESHOLDS
ERRORPROG
MAXRECALLDAEMONS
MAXRECONCILEPROC
MAXTHRESHOLDPROC
MINRECALLDAEMONS
RECONCILEINTERVAL
```

For example, if you want the space monitor daemon to check space usage on your file systems more frequently or less frequently, you can change the value specified for the CHECKTHRESHOLDS option. Or, if you frequently use an application that opens multiple files at one time, and that application uses all available recall daemons because all of the files are migrated, you might want to increase the value specified for the MAXRECALLDAEMONS option. If HSM is unable to start a recall daemon for another process that attempts to access a migrated file, that process will be unable to continue until a recall daemon is available.

If you change the values specified for options used by space management daemons, the new values do not take effect until you reboot your system or kill and restart the space monitor daemon and any recall daemons that are running.

For detailed information about the space monitor daemon and recall daemons, see “Starting the Space Monitor Daemon” on page 62 and “Starting a Recall Daemon” on page 62.

To kill the space monitor daemon and recall daemons:

1. Use the **dsmq** command to obtain the recall ID and the recall daemon process ID for each recall process that is currently in the queue.

For more information, see “dsmq — Displaying the Status of Recall Processes” on page 149.

2. Use the **dsmrm** command to remove each recall process from the queue.

For more information, see “dsmrm — Removing a Recall Process from the Queue” on page 156.

3. Use the **kill -9** command to kill the space monitor daemon (dsmmonitor) and any recall daemons (dsmrecalld) that are running.
4. Verify that the daemons are no longer running.

To restart the daemons, issue these commands:

```
dsmmonitor  
dsmrecalld
```

**Modifying the KERNELMESSAGES Option:** If you change the value specified for the KERNELMESSAGES option, the new value does not take effect until the next time the HSM kernel extension is loaded for your workstation.

The kernel extension is loaded each time you reboot your system or, if none of the file systems to which you add space management are automatically mounted when you reboot, whenever you mount the first of one or more file systems to which you have added space management.

## Client User Options

A client user options file can contain these types of ADSM options:

- Node and server options
- Backup and archive options
- Restore and retrieve options
- Format and language options
- Command and error processing options
- Information availability option

Most of those options affect only the ADSM backup-archive client. However, some options, such as the TAPEPROMPT option and the RESTOREMIGSTATE option, affect both the backup-archive client and the HSM client. In addition, HSM provides the OPTIONFORMAT option which you can set in a client user options file.

As a root user, you must create a default client user options file. Users can also create their own personalized client user options files. For detailed information about all of the options you can set in your default client user options file and instructions for creating a personalized client user options file, see *ADSTAR Distributed Storage Manager Installing the Clients*.

**TAPEPROMPT Option:** The TAPEPROMPT option affects backup, archive, restore, and retrieve processing. It also affects space management processing. If the TAPEPROMPT option is set to Yes, and the migration destination (specified in the management class assigned to a file) is a storage pool that consists of removable



media, such as tape, HSM issues a prompt during selective migration to allow the user to choose whether to wait for the media to be mounted or skip the file.

**RESTOREMIGSTATE Option:** The RESTOREMIGSTATE option determines whether ADSM restores a backup version or a stub file for a migrated or premigrated file during a restore operation.

For more information about restoring migrated and premigrated files, see Chapter 6, “Backing Up and Restoring Migrated and Premigrated Files” on page 85.

**OPTIONFORMAT Option:** The OPTIONFORMAT option determines whether users must enter ADSM HSM commands using the standard or short format.

The *standard format* allows users to enter commands in a format similar to the one used for ADSM backup and archive commands. The *short format* allows users to enter ADSM HSM commands in a format similar to the one used for operating system commands. For more detailed information about those formats, see Chapter 8, “Using Commands” on page 101.

**Note:** If you change the value specified for the OPTIONFORMAT option, the new value takes effect immediately.

## Excluding Files From Space Management

There are some files, such as system files and files created and used by ADSM HSM, that should not be migrated from a local file system. In addition, users may have certain files that they want to keep on a local file system at all times.

The files created and used by ADSM HSM reside in a hidden directory named **.SpaceMan** on each file system to which you add space management and in the **/etc/adsm/SpaceMan** directory ADSM creates when you install the ADSM HSM client. ADSM automatically excludes those files from space management. You do not need to take any action to ensure that those files remain on your local file systems.

## Creating an Include-Exclude Options File

To exclude additional files from space management services, you can create an include-exclude options file and set one or more exclude options in that file.

You specify the name of an include-exclude options file with the INCLEXCL option in your client system options file. A file you specify with that option must reside in a directory to which all users on your workstation have read access.

Figure 7 provides a brief description of each option you can specify in an include-exclude options file.

Figure 7. Options set in an Include-Exclude Options File

Option	Description
EXCLUDE	Excludes a file from both space management services and backup services. Any file you exclude with this option is not considered for migration or backup.
EXCLUDE.SPACEMGMT	Excludes a file from space management services only. Any file you exclude with this option is not considered for migration.
EXCLUDE.BACKUP	Excludes a file from backup services only. Any file you exclude with this option is not considered for backup. Note that you cannot exclude a file from being archived.
INCLUDE	<p>Includes a file for both space management services and backup services. When you exclude a group of files, you can use an INCLUDE option to include a subset of those files.</p> <p>You can also use this option to:</p> <ul style="list-style-type: none"><li>• Assign a specific management class to a file or group of files</li><li>• Assign a management class to all files to which you do not assign a specific management class</li></ul>

You can create an include-exclude options file for each ADSM server your client node contacts for services.

For example, if your client system options file contains two stanzas that contain options for two different servers, you can include an INCLEXCL option in each stanza. Each INCLEXCL option can point to a different include-exclude options file.

If you exclude a file from space management after it has already been migrated to ADSM storage, it remains migrated until it is automatically or selectively recalled. After it is recalled, it is no longer eligible for migration.

For more detailed information about the include-exclude options and creating an include-exclude options file, see *ADSTAR Distributed Storage Manager Installing the Clients*.

For information about which files you should exclude from backup services, see *ADSTAR Distributed Storage Manager Using the UNIX Backup-Archive Clients*.

**Note:** You can also prevent a file from being migrated from a local file system to ADSM storage by assigning it a management class that specifies that neither automatic or selective migration is allowed.

## Processing Include-Exclude Options

ADSM processes the options you set in an include-exclude options file from the *bottom up*.

For example, if you want to exclude an entire directory named **/home/holland/project1** from both space management and backup services, but you want to allow one file in the directory named **devplan** to be migrated, and you want one file named **status** to be backed up, you would enter options in your include-exclude options file as follows:

```
exclude      /home/holland/project1/*
include      /home/holland/project1/devplan
exclude.backup /home/holland/project1/devplan
include      /home/holland/project1/status
exclude.spacemgmt /home/holland/project1/status
```

When HSM builds a migration candidates list for a file system, and when it migrates the files included in that list, it tests each file against the options in your include-exclude options file. It begins with the last option specified and works up. If a match is found, it does not test the file against any additional options. It either excludes or includes the file as specified by the option. If no match is found, the file is implicitly included for space management and backup services.

### Assigning Management Classes to Files

Your ADSM administrator defines the management classes you can assign to the files in your local file systems. You can use a default management class for some or all of your files, and you can assign different management classes to specific files or groups of files.

For instructions to display information about the management classes that are available for you to assign to files, see “Displaying Information About Management Classes” on page 81.

To assign specific management classes to files or groups of files, you can set multiple INCLUDE options in your include-exclude options file. Figure 8 lists the *space management attributes* that are included in a management class. It also shows the defaults for space management attributes in the management class delivered with ADSM.

Figure 8 (Page 1 of 2). Space Management Attributes in a Management Class

Attribute	Description
Space Management Technique	<p>Determines whether a file is eligible for automatic and selective migration, selective migration only, or neither.</p> <p>The value for this attribute can be:</p> <p><b>Auto</b>      The file is eligible for both automatic and selective migration.</p> <p><b>Selective</b>    The file is eligible for selective migration only.</p> <p><b>None</b>        The file is not eligible for migration.</p> <p>The default is None.</p>

Figure 8 (Page 2 of 2). Space Management Attributes in a Management Class

Attribute	Description
Auto Migrate on Non-usage	Specifies the number of days (0 to 9999) that must elapse since the file was last accessed before it is eligible for automatic migration.  The default is 0.
Backup Required Before Migration	Determines whether a current backup version of the file must exist on your migration server before the file is eligible for automatic or selective migration.  The value for this attribute can be: <b>Yes</b> A current backup version must exist. <b>No</b> A current backup version is optional.  The default is Yes.  <b>Attention:</b> If this attribute is set to Yes in the management class assigned to a file, ADSM checks for a current backup version of the file only on your migration server. If a current backup version does not exist on your migration server, the file is not migrated, even if a current backup version exists on another server.
Destination for Migrated Files	Specifies the name of the ADSM storage pool in which ADSM stores the file when it is migrated.  The default is SPACEMGPOOL.

A management class can also contain a *backup copy group* and an *archive copy group*. Copy groups contain attributes that control the generation, destination, and expiration of backup versions of files and archived copies of files. For detailed information about backup and archive copy groups, see *ADSTAR Distributed Storage Manager Using the UNIX Backup-Archive Clients*.

If your client node communicates with the same ADSM server for both space management and backup-archive services, the management class you assign to a file must contain both the space management attributes *and* the backup and archive copy groups you want ADSM to use for the file.

If you migrate files to one server and back up and archive files to one or more different servers, you can specify a different include-exclude options file for each server. Only one management class can be assigned to a file in a specific include-exclude options file. However, the include-exclude options files pointed to for each server can specify a different management class in each one.

For example, if files in **/home/holland** are backed up to SERVER1, the include-exclude options file used for that server might specify a management class named MGMT1A for a file named **/home/holland/testfile**. That management class must contain an appropriate backup copy group for the file.

If the files in the **/home** file system are migrated to SERVER2, the include-exclude options file used for that server might specify a management class named MGMT2B for the same file. That management class must contain appropriate space management attributes for the file.

For detailed information about using the INCLUDE option to assign management classes to files, see *ADSTAR Distributed Storage Manager Installing the Clients*.

## Modifying Include-Exclude Options

If you modify the INCLEXCL option in your client system options file or add or modify an option in your include-exclude options file, the new values do not take effect until you reboot your system or kill and restart the space monitor daemon.

## Mounting Your File Systems

A file system must be mounted either automatically or manually before you can add space management to it, and the *file system migrator* (FSM) must be mounted over the file system before HSM can provide space management services.

The file system migrator is a kernel extension that intercepts all file system operations and provides any space management support that is required. If no space management support is required, the operation is performed by your operating system.

For example, when you access a file, HSM determines whether the file is migrated. If it is, HSM automatically recalls it back to your workstation using the recall mode that is in effect. If the file is not migrated, your operating system accesses the file.

You can add space management to the following types of file systems:

- Journaled File System (JFS) on an AIX workstation
- UNIX File System (UFS) on a Sun Solaris 2.5 workstation

### Attention

After you add space management to a file system, you should not unmount the FSM and access the native file system directly. If the FSM is not mounted, stub files can be accessed and modified by anyone who has permission to access the migrated files. If a stub file is modified, HSM cannot use it to access a migrated file.

## Mounting File Systems and the FSM Automatically

If the file listed below contain entries for a file system to which you add space management, then HSM updates those entries (when you add space management to the file system) so that the file system and the FSM are both mounted automatically whenever you reboot your system.

- On a JFS file system, the **/etc/filesystems** file
- On a UFS file system, the **/etc/vfstab** file

If the file does not contain entries for the file system, you must mount the file system and the FSM manually.

### Mounting File Systems and the FSM Manually

If the file listed above does not contain an entry for a file system, you must mount the file system using the **mount** command before you can add space management to it.

Then, whenever you reboot your system or unmount the file system, you must enter the following command to mount the file system and the FSM:

- On a JFS file system:

```
mount -n - -v fsm -l log=/dev/hd8 /dev/lv09 /migfs1
```

where *log=/dev/hd8* is the JFS log logical volume for the file system, */dev/lv09* is the file system logical volume, and *migfs1* is the mount point.

- On a UFS file system:

```
mount -F fsm /dev/dsk/c0t3d0s4 /migfs1
```

where */dev/dsk/c0t3d0s4* is the device you want to mount and *migfs1* is the file system mount point.

### Remounting the FSM

If you unmount the FSM from a file system, you can remount it as follows:

- On a JFS file system:

If you unmount the FSM, and the **/etc/filesystems** file contains a stanza for the file system, you can remount the FSM by entering this command:

```
mount -v fsm /migfs1
```

If the **/etc/filesystems** file does *not* contain a stanza for the file system, you can remount the FSM by entering this command:

```
mount -n - -v fsm -l log=/dev/hd8 /dev/lv09 /migfs1
```

where *log=/dev/hd8* is the JFS log logical volume for the file system, */dev/lv09* is the file system logical volume, and *migfs1* is the mount point.

- On a UFS file system:

If you unmount the FSM from a UFS file system, and the **/etc/vfstab** file contains an entry for the file system, you can remount the FSM using this command:

```
mount /migfs1
```

If the **/etc/vfstab** file does *not* contain an entry for the file system, you can remount the FSM using this command:

```
mount -F fsm /migfs1 /migfs1
```

### Adding Space Management to Nested File Systems

A nested file system is a file system mount point contained within another file system.

For example:

```
/test
/test/migfs1
```

**/test** and **/test/migfs1** are both mount points. **/test** is a parent file system and **/test/migfs1** is a nested file system within **/test**.

To add space management to a parent file system and all of its nested file systems:

1. Unmount the nested file systems.
2. Add space management to the parent file system.
3. Remount the nested file systems.
4. Add space management to each nested file system.

For instructions to add space management to a file system, see “Adding Space Management to Your File Systems” on page 34.

### **Adding Space Management to a Parent File System Only**

To add space management to a parent file system, but not to its nested file systems:

1. Unmount the nested file systems.
2. Add space management to the parent file system.
3. Remount the nested file systems.

On an AIX workstation, if a nested file system is set up to mount automatically when you reboot your system, follow these steps:

1. Issue this command:

```
smit jfs
```
2. Select Change / Show Characteristics of a Journaled File System
3. Choose the nested file system.
4. Set Mount AUTOMATICALLY at system restart? to no
5. Select Do
6. Edit the **/etc/rc.adsmhsm** file that is shipped with ADSM HSM and add the following in the nested file system section at the end of the file:

```
mount /test/migfs1
```

where **/test/migfs1** is the name of the nested file system.

This procedure allows the parent file system to be mounted before the nested file system is mounted.

### **Adding Space Management to a File System Exported by NFS**

NFS servers can export a file system to which you have added space management, but you must be careful to follow these setup steps:

1. Have all NFS clients unmount the exported file system

To see which clients are currently mounting the exported file system, you can run:

```
showmount -a
```

2. Add space management to the file system.

3. To export the NFS file system again, run:

```
exportfs /filesystem
```

where */filesystem* is the name of the exported file system.

4. Have all NFS clients remount the exported NFS file system.

## Adding Space Management to Your File Systems

After you install ADSM HSM on your workstation, you must add space management to each file system for which you want space management services. You can add space management to the following types of file systems:

- Journaled File System (JFS) on an AIX workstation
- UNIX File System (UFS) on a Sun Solaris 2.5 workstation

A file system must be mounted before you can add space management to it.

When you add space management to a file system, HSM does the following:

- Creates a hidden directory named **.SpaceMan** in the file system.

HSM uses the **.SpaceMan** directory to store the objects listed in Figure 10 on page 35.

- Adds an entry for the file system to the **dsmmigfstab** file stored in the **/etc/adsm/SpaceMan/config** directory.

Each entry in the **dsmmigfstab** file includes the name of a file system to which you have added space management and the space management settings you select for that file system. Figure 9 shows a sample **dsmmigfstab** file.

Filesystem Name	High (%) Thrshld	Low (%) Thrshld	Premig(%) Percent	Age Factor	Size Factor	Quota	Stubsizesize
/home	90	80	-	1	1	200	4095
/migfs1	80	60	40	0	1	100	8191
/migfs2	95	75	-	1	0	100	2047

Figure 9. Sample **dsmmigfstab** File

**Note:** Be sure to maintain a current backup version of the **dsmmigfstab** file at all times.

- Updates information for the native file system.

*For a JFS file system (AIX):* If the **/etc/filesystems** file contains a stanza for the file system, HSM does the following:



1. Changes the **mount** attribute from true to false

This prevents the operating system from mounting the file system automatically when the operating system is booted.

2. Adds a **nodename** attribute to the stanza for the file system with a value of – (a dash)

The nodename attribute tells the mount command to call the HSM mount helper.

3. Adds an **adsmfsm** attribute to the stanza for the file system with a value of true

The **adsmfsm** attribute indicates that the file system is managed by HSM.

*For a UFS file system (Solaris 2.5):* If the **/etc/vfstab** file contains an entry for the file system, ADSM adds a new attribute with a file system type of fsm.

- Mounts the file system migrator (FSM) over the native file system.
- Activates space management for the file system.

Space management must be active for a file system before HSM can begin providing space management services.

**Note:** During the mount process and while HSM is in the process of adding space management to a file system, users should not attempt to access any files in the file system or perform any tasks against the file system.

## Space Management Objects

Figure 10 provides brief descriptions of objects stored in the **.SpaceMan** directory in each file system to which you add space management. HSM requires those objects for processing.

**Note:** HSM can also create other objects in the **.SpaceMan** directory during space management processing. Do *not* delete or modify the **.SpaceMan** directory, its contents, or any of the file ownerships and permissions.

Figure 10 (Page 1 of 2). Objects Stored in .SpaceMan Directory

Object	Description
candidates	HSM uses this file to store a migration candidates list for the file system.  <i>A migration candidates list is a prioritized list of files that are eligible for automatic migration at the time the list is built. HSM builds a new migration candidates list for a file system each time reconciliation is run and before running threshold migration if the list is empty.</i>
orphan.stubs	HSM uses this file to record the name of any file for which a stub file exists on the local file system, but no corresponding migrated file exists in ADSM storage.
status	HSM uses this link to point to a file that records space management related statistics for the file system.

Figure 10 (Page 2 of 2). Objects Stored in .SpaceMan Directory

Object	Description
premigldb.dir premigldb.pag	HSM uses these files to store the <i>premigrated files database</i> . The database contains information about each file that has been premigrated to ADSM storage.
logdir	HSM uses this directory to record information about files while they are in the process of being migrated or recalled. It uses that information to complete any transactions that are interrupted when, for example, a system failure occurs.

## File System States

After you add space management to specific file systems, each file system on your workstation or file server is in one of the *file system states* listed in Figure 11.

Figure 11. File System States

File System State	Description
Native (n)	Space management has not been added to the file system.  If you do not add space management to a file system, HSM cannot provide any space management services for the file system.
Active (a)	Space management has been added to the file system.  When you add space management to a file system, HSM automatically activates space management for the file system, and can perform all space management services for the file system.

You can change the state of a file system by adding space management to it or performing one of the tasks discussed in “Managing Your File Systems” on page 44.

## File States

After you add space management to a file system, and HSM begins providing space management services, each file in the file system is in one of the *file states* listed in Figure 12.

Figure 12 (Page 1 of 2). File States

File State	Description
Resident (r)	The file resides on the local file system. It has not been migrated or premigrated, or it has been recalled from ADSM storage and modified. When first created, all files are resident.

Figure 12 (Page 2 of 2). File States

File State	Description
Migrated (m)	The file has been copied to ADSM storage and replaced by a stub file on the local file system. The stub file contains the information necessary to recall the migrated file back to the local file system.
Premigrated (p)	An identical copy of the file resides both on the local file system and in ADSM storage. A file remains premigrated until one of the following occurs: <ul style="list-style-type: none"> <li>• HSM changes it to a migrated state during automatic or selective migration</li> <li>• HSM changes it to a resident state when it is accessed by a process that modifies it, or when it is accessed by a process, such as <b>touch</b> or <b>chmod</b>, that alters the inode change time (ctime) for the file.</li> </ul>

### Adding Space Management

To add space management to one or more file systems, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window shown in Figure 13 appears.

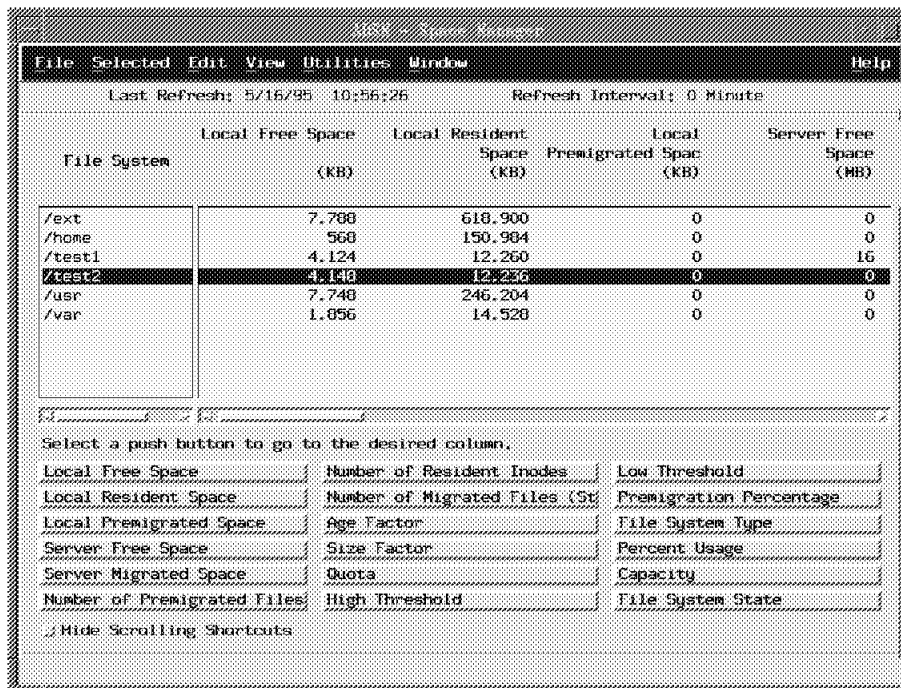


Figure 13. Space Manager Window

Only file systems supported by ADSM HSM are listed in the Space Manager window.

**Note:** Some column headings in the File System view might be truncated. To display the complete headings, specify a larger column width using the ADSM Column Layout for Space Manager window. To open the Column Layout window, select the Column Layout menu choice from the View menu.

2. Select the file systems to which you want to add space management by clicking on them.

HSM does not allow you to add space management to your root (*/*) or */tmp* file systems. In addition, it is recommended that you do not add space management to your */usr* and */var* file systems. All of those file systems contain files that your operating system uses on a regular basis.

3. Click on the **Selected** menu; **Add Space Management** item.

The Add Space Management window shown in Figure 14 appears. It displays default values for all space management settings.

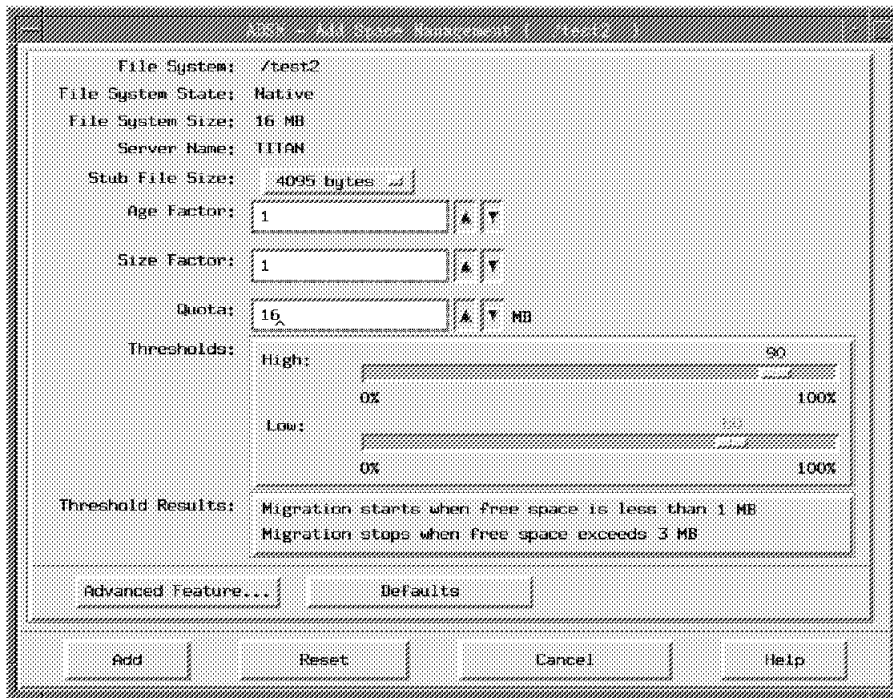


Figure 14. Add Space Management Window

When you select more than one file system, HSM displays a window for each file system and arranges them in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. In the Add Space Management window, leave default values for space management settings, or select different values.

For detailed information about a particular setting, see “Choosing Space Management Settings,” or highlight the setting, and then press **F1** or the **Help** key.

5. After you select the values you want for space management settings, click on **Add** to add space management to the file system.

An Information Dialog window appears to inform you when HSM has finished adding space management to the file system.

6. Click on **OK** to close the Information Dialog window.

#### Using a Command

You can also use the **dsmmigfs** command to add space management to a file system. For example, to add space management to the **/home** file system and set a high threshold of 85 percent and a low threshold of 75 percent, enter:

```
dsmmigfs add -ht=85 -l=75 /home
```

For detailed information about that command, see “dsmmigfs — Adding or Updating Space Management” on page 123.

## Choosing Space Management Settings

When you add space management to a file system, you select space management settings that control:

- How much data is stored in stub files
- How large a file must be before it can be migrated
- The order in which files are migrated during automatic migration
- The total number of megabytes of data that can be migrated and premigrated to ADSM storage
- How much free space HSM maintains on your local file system

After you add space management to a file system, you can update those settings if necessary.

The following sections provide information to help you choose space management settings for your file systems.

### Stub File Size

A stub file contains the information necessary to locate and recall a migrated file and information that HSM can use to respond to specific commands provided by your operating system, such as **ls**, **find**, **df** and **du**, without recalling the file.

Depending on the *stub file size* you specify for stub files stored on a local file system, a stub file can also contain leading bytes of data from the original file. That data is called

*leader data*. If only that data is accessed and is not modified, HSM does not recall the migrated file from ADSM storage. Storing leader data in stub files is especially useful if you frequently run one or more programs that read only the information found at the beginning of a large number of files.

Valid stub file sizes are 511, 1023, 2047, 4095, 8191, 16383, and 32767 bytes. HSM uses stub file sizes that are a power of 2 minus one byte to make it easier to identify potential stub files.

The minimum stub file size is 511 bytes. That is the amount of space needed to store required stub file information, such as the *migration object ID* that HSM uses to recall a migrated file, and information that identifies the file as a stub file. If you choose a stub file size that is larger than 511 bytes, HSM uses any remaining bytes to store leader data.

The default stub file size is the file system block size minus one byte. For example, if the block size defined for a file system is 4096, the default stub file size is 4095. HSM uses 511 bytes for required stub file information, and uses the remaining 3584 bytes to store leader data.

When selecting a stub file size, weigh the advantage of storing additional leader data (files are not recalled if only leader data is accessed and not modified), and the disadvantage of using additional space on your local file system for stub files (larger stub files consume more storage space on your local file system).

**Note:** You can choose a stub file size that is smaller than the file system block size. However, that causes inefficient use of space on your file system. Even though HSM uses only the number of bytes you specify for stub files, your operating system still allocates one block for each stub file. The number of bytes in excess of the stub file size you choose are unused.

### **Minimum File Size for Migration**

HSM does not migrate a file unless doing so saves space on the local file system. Before a file is considered for migration, its size must be greater than both the stub file size plus one byte and the file system block size.

For example, if the stub file size is 2047 bytes, and the block size defined for a file system is 4096 bytes, a file's size must be greater than 4096 bytes before it is eligible for migration.

### **Age and Size Factors**

HSM determines the order in which eligible files are migrated to ADSM storage during automatic migration by using the age and size factors you set. To determine migration priority, HSM multiplies the age of a file by the age factor, and multiplies the size of the file by the size factor. Then, it adds the products of those two calculations to produce a priority score. HSM prioritizes files for migration in descending order by priority score.

The age of the file in this case is the number of days since a file was last accessed. The age is determined by the following calculation:

$$\text{age} = (\text{current time} - \text{atime}) / (60 * 60 * 24)$$

The size of the file in this case is its size in 1-KB blocks.

You can set a value from 0 to 999999999 for both the age and size factor. The default is 1 for both factors.

If you want HSM to prioritize files for migration only by age, set the age factor to 1 and the size factor to 0.

If you want HSM to prioritize files for migration only by size, set the age factor to 0 and the size factor to 1.

To place more weight on the age of a file, increase the age factor. To place more weight on the size of a file, increase the size factor.

The following examples demonstrate how you can adjust the age and size factors to prioritize files based on both age and size. Figure 15 lists the files used in the examples.

Figure 15. Files Eligible for Migration

File Name	Age (days since last accessed)	Size (in 1-KB blocks)
File1	30	10
File2	60	10
File3	30	100
File4	10	500
File5	30	500

**Example 1:** To ensure that HSM prioritizes the files in order by age, and within age, by size, you can set the size factor to 1, and set the age factor to the size of the largest file you store on the file system or to the size of the file system itself (in 1-KB blocks). For example, for a 200-MB file system, set the age factor to 200000.

If the age factor is 200000, and the size factor is 1, the migration order for the files shown in Figure 15 is:

Figure 16. Migration Order for Example 1

Order	File Name	Priority Score
1	File2	$(60 * 200000) + (10 * 1) = 12000010$
2	File5	$(30 * 200000) + (500 * 1) = 6000500$
3	File3	$(30 * 200000) + (100 * 1) = 6000100$
4	File1	$(30 * 200000) + (10 * 1) = 6000010$
5	File4	$(10 * 200000) + (500 * 1) = 2000500$

In this example, HSM assigns the highest priority to the oldest files. If two or more files are the same age, HSM prioritizes those files by size.

**Example 2:** To ensure that HSM prioritizes the files for migration in order by size, and within size, by age, set the age factor to 1, and set the size factor to the number of days equal to the longest life span of a file on the file system. For example, if the longest life span is ten years, set the size factor to 3650.

If the age factor is 1, and the size factor is 3650, the migration order for the files shown in Figure 15 on page 41 is:

Figure 17. Migration Order for Example 2

Order	File Name	Priority Score
1	File5	$(30 * 1) + (500 * 3650) = 1825030$
2	File4	$(10 * 1) + (500 * 3650) = 1825010$
3	File3	$(30 * 1) + (100 * 3650) = 365030$
4	File2	$(60 * 1) + (10 * 3650) = 36560$
5	File1	$(30 * 1) + (10 * 3650) = 36530$

In this example, HSM assigns the highest priority to the largest files. If two or more files are the same size, HSM prioritizes those files by age.

**Note:** If a resident file and a premigrated file have the same priority score, HSM assigns the premigrated file higher priority.

## Quota

The quota setting you choose determines the total number of megabytes of data that can be migrated and premigrated from the file system to ADSM storage.

The default is the number of megabytes allocated for the file system itself. For example, if 200 MB of space are allocated for a file system, HSM can migrate and premigrate files from that file system until the total number of megabytes migrated and premigrated equals 200 MB.

**Note:** When files are premigrated, they use space on both the local file system and in ADSM storage, and when files are migrated, stub files use some of the space on the local file system.

You can specify a value from 0 to 999999999. Be sure to set the quota for a file system to a value that is large enough to accommodate projected growth for the file system. Check with your ADSM administrator to determine whether there are any restrictions on the amount of data you can migrate and premigrate to ADSM storage.

If you set the quota for a file system to 0, no files can be migrated to ADSM storage.



## Thresholds

The thresholds you set for a file system affect when HSM starts and stops threshold migration.

The *high threshold* determines when HSM starts threshold migration. For example, if 100 MB are allocated for a file system, and you want to maintain at least 10 MB of free space, set the high threshold to 90 percent (the default). If space usage equals or exceeds 90 percent when HSM checks space usage on the file system, ADSM automatically begins migrating files to ADSM storage.

HSM migrates files beginning with the first file listed in the current migration candidates list for the file system. It continues migrating files until space usage drops to the *low threshold* set for the file system as long as there are enough files listed in the migration candidates list to attain that goal. For example, if you want HSM to stop migrating files when there are 20 MB of free space available on the file system, set the low threshold to 80 percent (the default).

Figure 18 illustrates how threshold migration works.

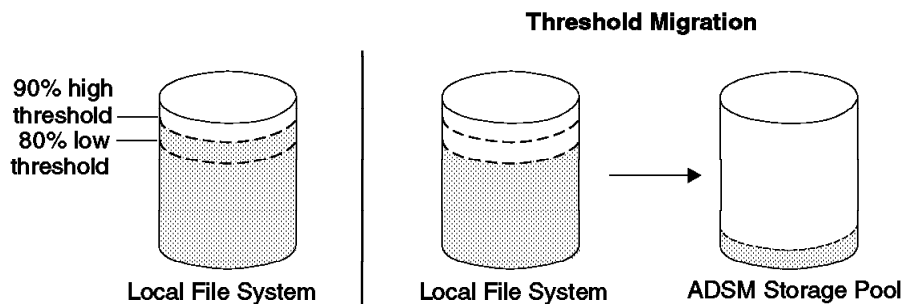


Figure 18. Threshold Migration

If space usage equals or exceeds the high threshold set for a file system, and the migration candidates list for the file system is empty or does not exist, HSM runs reconciliation to build a new migration candidates list.

If there are no additional candidates in the migration candidates list after threshold migration has started and space usage has dropped below the high threshold, threshold migration stops. HSM does not attempt to build a new migration candidates list at that time.

The default for the high threshold is 90 percent. You can specify a value of 0 to 100.

The default for the low threshold is 80 percent. You can specify a value of 0 to 100. However, the percentage you specify for the low threshold must be the same as or lower than the percentage you specify for the high threshold.

## Setting a Premigration Percentage

HSM provides an additional space management setting, called the *premigration percentage*, that you can update as an advanced feature. That setting controls whether HSM premigrates additional files after completing threshold or demand migration. When HSM completes threshold or demand migration, it removes the names of any files it migrated from the current migration candidates list. To premigrate the next files listed in the migration candidates list, HSM sends copies of the files to ADSM storage, and leaves the original files intact on the local file system as premigrated files.

The default for the premigration percentage is the difference between the percentage specified for the low threshold and the percentage specified for the high threshold. The default percentage allows HSM to premigrate enough files to make the next occurrence of threshold migration faster.

For example, if the high threshold is 90 percent and the low threshold is 80 percent, the premigration percentage is 10 percent. That means that after HSM migrates enough files to drop space usage to 80 percent, it premigrates additional files until at least 10 percent of the space occupied on the file system contains premigrated files that are listed at the beginning of the current migration candidates list. The next time threshold migration is required, HSM can release 10 percent of the space occupied by files on the local file system by simply replacing those files with stub files on the local file system. That brings space usage down to the low threshold quickly, without requiring the time necessary to copy the files to ADSM storage.

If demand migration is required, having the next files that are eligible for automatic migration already premigrated speeds up that process as well. HSM can release at least 10 percent of the space on the local file system quickly and easily, and then migrate any additional files necessary to bring space usage down to the low threshold.

During premigration, if any of the files listed at the beginning of the migration candidates list are already premigrated, HSM skips them, and premigrates only those files required to reach the premigration percentage.

You can change the premigration percentage if you want HSM to premigrate more or fewer files.

If the percentage specified for the low threshold is the same as the percentage specified for the high threshold, the default premigration percentage is zero. HSM does not premigrate any files after threshold or demand migration is complete.

If the premigration percentage equals or exceeds the percentage specified for the low space usage threshold, HSM premigrates all remaining files in the file system that are currently eligible for automatic migration.

---

## Managing Your File Systems

After you add space management to your local file systems, you can perform these tasks:

- Update space management settings for a file system
- Deactivate space management for a file system
- Reactivate space management for a file system
- Remove space management from a file system
- Globally deactivate space management for your client node
- Globally reactivate space management for your client node

Except for updating space management settings, each of those tasks affects the state of a file system. The possible file system states are:

File System State	Description
Native (n)	Space management has not been added to the file system or has been removed from the file system.
Active (a)	Space management is active for the file system. HSM performs all space management services for the file system. The state of a file system is active when you add space management to the file system, or when you reactivate a file system.
Inactive (i)	Space management is not active for the file system. HSM cannot perform migration, recall, or reconciliation for an inactive file system. However, all other space management tasks can be performed. For example, a root user can update space management settings for the file system, and users can display information about the file system. In addition, users can continue to access resident and premigrated files.  A file system becomes inactive when you deactivate space management for the file system.
Global Inactive (gi)	Space management is not active for your client node. HSM cannot perform migration, recall, or reconciliation for any file system on your client node. However, all other space management tasks can be performed. For example, a root user can update space management settings for file systems, add space management to additional file systems, and change your ADSM password. Users can display information about their own file systems. In addition, users can continue to access resident and premigrated files.  A file system becomes globally inactive when you globally deactivate space management for your client node.

## Updating Space Management Settings

You can update space management settings for a file system at any time, regardless of whether space management is active, inactive, or global inactive for a file system.

Changes to space management settings take effect as follows:

- If you change the high and low thresholds or the premigration percentage for a file system, the new values take effect immediately.
- If you change the stub file size, the new value becomes effective only for files that are migrated after you make the change.
- If you change the age and size factors, the new values are used the next time a migration candidates list is built.
- If you reduce the quota, and the amount of data currently migrated and premigrated to ADSM storage exceeds the new quota, HSM does not migrate any additional files from the file system until enough files have been recalled during automatic or selective recall to drop the total number of megabytes of migrated and premigrated data below the new quota.

To update space management settings for a file system, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.  
The Space Manager window appears.
2. In the Space Manager window, select the file systems for which you want to update space management settings by clicking on them.
3. Click on the **Selected** menu; **Update Space Management** item.

The Update Space Management window shown in Figure 19 on page 47 appears.

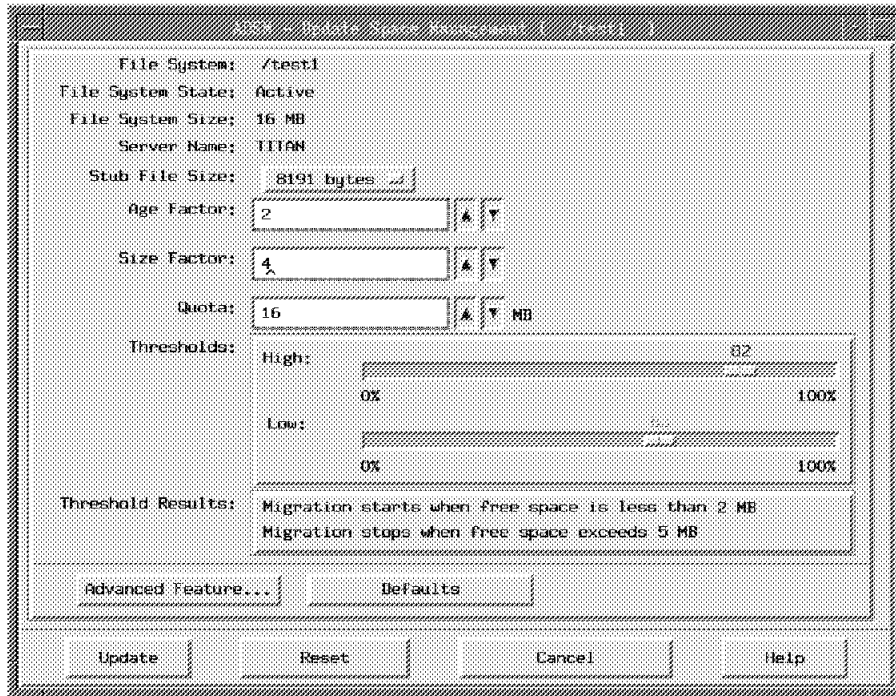


Figure 19. Update Space Management Window

When you select more than one file system, HSM displays a window for each file system and arranges them in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. In the Update Space Management window, select new values for one or more space management settings.

For detailed information about a particular setting, highlight the setting, and then press **F1** or the **Help** key.

5. Click on **Update** to update the space management settings with the values you selected.

An Information Dialog window appears to inform you when HSM has finished updating the space management settings.

6. Click on **OK** to close the Information Dialog window.

### Using a Command

You can also use the **dsmmigfs** command to update space management settings for a file system. For example, to change the age factor to 5 and the size factor to 1 for the **/home** file system, enter:

```
dsmmigfs update -a=5 -si=1 /home
```

For detailed information about that command, see “dsmmigfs — Adding or Updating Space Management” on page 123.

## Deactivating Space Management for a File System

You can deactivate space management for a file system if you want to prevent HSM from performing migration, recall, and reconciliation for a file system temporarily. You can reactivate space management for the file system whenever you want HSM to resume all space management services.

When you deactivate space management for a file system, HSM allows any migration, recall, or reconciliation process that is currently in progress to be completed first. For example, if threshold migration is in progress for the file system, HSM finishes migrating the file that is currently being migrated, and then stops threshold migration and deactivates the file system. Or, if selective recall is in progress for a group of files, HSM finishes recalling the file that is currently being recalled, and then deactivates the file system.

When space management is inactive for a file system, you can update space management settings for the file system. Users can display space management related information about the file system and can continue to access resident and premigrated files.

To deactivate space management for a file system, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.  
The Space Manager window appears.
2. In the Space Manager window, select the file systems for which you want to deactivate space management by clicking on them.
3. Click on the **Selected** menu; **Deactivate Space Management** item.  
An Information Dialog window appears to inform you when HSM has finished deactivating space management for each file system you selected.
4. Click on **OK** to close the Information Dialog window.

#### Using a Command

You can also use the **dsmmigfs** command to deactivate space management for a file system. For example:

```
dsmmigfs deactivate /home
```

For detailed information about that command, see “dsmmigfs — Deactivating, Reactivating, or Removing Space Management” on page 129.

## Reactivating Space Management for a File System

After you deactivate space management for a file system, you can reactivate it at any time.

To reactivate space management for a file system, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. In the Space Manager window, select the file systems for which you want to reactivate space management by clicking on them.
3. Click on the **Selected** menu; **Reactivate Space Management** item.

An Information Dialog window appears to inform you when HSM has finished reactivating space management for each file system you selected.

4. Click on **OK** to close the Information Dialog window.

#### Using a Command

You can also use the **dsmmigfs** command to reactivate space management for a file system. For example:

```
dsmmigfs reactivate /home
```

For detailed information about that command, see “dsmmigfs — Deactivating, Reactivating, or Removing Space Management” on page 129.

## Removing Space Management from a File System

You can completely remove space management from a file system. To remove space management from a file system, space management must be active for the file system, and there must be enough space on the file system to recall all of its migrated files.

### Attention

Before you begin removing space management from a file system, ensure that the file system is not being accessed and all activity on the file system has stopped.

On an AIX workstation, if the file system is being accessed when you remove space management, the FSM cannot be unmounted from the file system, and ADSM backup-archive and space management functions will not work correctly. If the FSM is not unmounted when you remove space management from a file system, issue the **umount** command for the file system to unmount it after all processes are finished accessing the file system.

When you remove space management from a file system, HSM does the following:

- Runs reconciliation for the file system.

If any orphaned stub files are found, HSM notifies you.

An *orphaned stub file* is a stub file for which ADSM cannot locate a corresponding migrated file in ADSM storage. A stub file can become orphaned if, for example, you change the name of the server your client node contacts for space management services in your client system options file after files have been migrated to a previously specified server.

Check the **orphan.stubs** file in the **.SpaceMan** directory for a list of orphaned stub files. To remove space management, you must resolve all orphaned stub files, and then try again. For more information, see “Resolving Orphaned Stub Files” on page 62.

- Determines how much space is required to recall all migrated files.

If there is not enough space, HSM notifies you. To remove space management, you must make space available, and then try again.

- Recalls migrated files back to the file system in the most efficient recall order based on where they are stored.
- Notifies the server to delete all migrated files from ADSM storage.
- Unmounts the file system migrator (FSM) from the file system.
- Removes the entry for the file system from the **dsmmigfstab** file stored in the **/etc/adsm/SpaceMan/config** directory, and deletes the **.SpaceMan** directory from the file system.
- Updates information for the native file system.

*For a JFS file system (AIX):* If the **/etc/filesystems** file contains a stanza for the file system, HSM sets the **mount** attribute to **true** and removes the **nodename** and **adsmfsm** attributes.

*For a UFS file system (Solaris 2.5):* If the **/etc/vfstab** file contains an entry for the file system, HSM removes the **fsm** attribute it added when you added space management to the file system.



To remove space management from one or more file systems, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. In the Space Manager window, select the file systems from which you want to remove space management by clicking on them.
3. Click on the **Selected** menu; **Remove Space Management** item.

The Question Dialog window shown in Figure 20 appears.

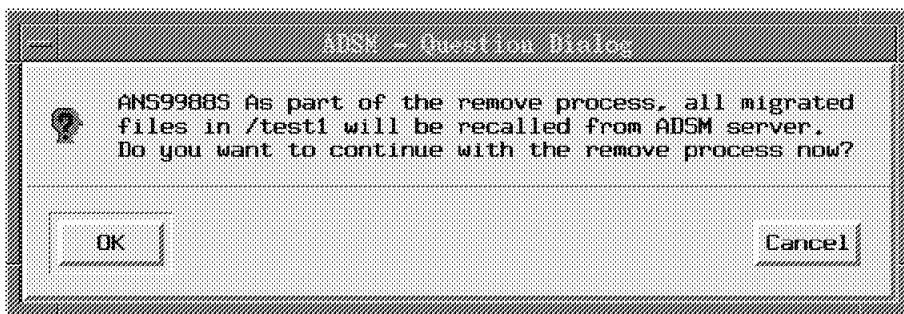


Figure 20. Question Dialog Window

When you select more than one file system, HSM displays a Question Dialog window for each file system, one at a time. The name of the file system to which a window applies appears in the text of the dialog.

4. Click on **OK** to allow HSM to recall all migrated files and continue with the remove process.

The Remove Status window appears.

5. Click on **Close** to close the Remove Status window.

**Notes:**

- If you click on **Cancel** in the Question Dialog window, HSM does not remove space management from the file system.
- If you click on **Stop** in the Remove Status window, any file that HSM has already recalled remains in a premigrated state, and space management is not removed from the file system. The file system remains in an active state.

### Using a Command

You can also use the **dsmmigfs** command to remove space management from a file system. For example, to remove space management from the **/home** file system, enter:

```
dsmmigfs remove /home
```

For detailed information about that command, see “dsmmigfs — Deactivating, Reactivating, or Removing Space Management” on page 129.

## Globally Deactivating Space Management

You can deactivate space management for all file systems on your client node temporarily. When you globally deactivate space management, HSM cannot perform migration, recall, or reconciliation for any file system.

You may want to globally deactivate space management, for example, before performing a system maintenance task. Or, you may want to globally deactivate space management if your ADSM administrator plans to export your migrated files from one server and import them to another. Then, after your ADSM administrator completes the export and import processes, you can globally reactivate space management for your file systems.

**Note:** If your administrator exports your migrated files from one server and imports them to another, be sure to update your client system options file so that your client node contacts the new server for space management services. Also note that your administrator can choose to use a LOCK NODE command to prevent your client node from migrating or recalling files prior to performing the import and export tasks.

When you globally deactivate space management, HSM allows any migration, recall, or reconciliation process that is currently in progress to be completed first. For example, if threshold migration is in progress for one or more file systems, HSM finishes migrating any file that is currently being migrated from each file system, and then globally deactivates space management.

When space management is globally deactivated, you can update space management settings for file systems and add space management to additional file systems. Users can display information about their file systems, and can continue to access resident and premigrated files.

To globally deactivate space management, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. Click on the **File** menu; **Global Deactivate** item.

An Information Dialog window appears to inform you when HSM has finished deactivating space management for your client node.

3. Click on **OK** to close the Information Dialog window.

#### Using a Command

You can also use the **dsmmigfs** command to globally deactivate space management for your client node. For example:

```
dsmmigfs globaldeactivate
```

For detailed information about that command, see “dsmmigfs — Globally Deactivating or Reactivating Space Management” on page 132.

## Globally Reactivating Space Management

After you globally deactivate space management for your client node, you can globally reactivate it at any time.

When you globally reactivate space management for your client node, all file systems to which space management was previously added return to their previous state.

For example, if space management was activated for a file system when you globally deactivated space management for your client node, it becomes active again. Or, if space management was deactivated for a file system when you globally deactivated space management for your client node, it remains inactive.

If you add space management to a file system while space management is globally deactivated for your client node, when you globally reactivate space management, that file system becomes active.

To globally reactivate space management for your client node, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. Click on the **File** menu; **Global Reactivate** item.

An Information Dialog window appears to inform you when HSM has finished reactivating space management for your client node.

3. Click on **OK** to close the Information Dialog window.

#### Using a Command

You can also use the **dsmmigfs** command to globally reactivate space management for your client node. For example:

```
dsmmigfs globalreactivate
```

For detailed information about that command, see “dsmmigfs — Globally Deactivating or Reactivating Space Management” on page 132.

---

## Starting Threshold Migration

HSM continually monitors space usage on all file systems for which space management is active. If space usage equals or exceeds the high threshold set for a file system when HSM checks space usage, HSM automatically starts threshold migration to bring space usage down to the low threshold.

If you want to bring space usage down to the low threshold on a file system *before* it reaches the high threshold, you can start threshold migration yourself.

Before you start threshold migration for a file system, consider whether you need to build a new migration candidates list first. If a migration candidates list does not exist, or if the list is empty, HSM automatically runs reconciliation to attempt to build one when you start threshold migration. You do not need to take any action to build a new migration candidates list.

If the current migration candidates list is not empty, HSM migrates each file in the list that is still eligible for migration. However, additional files might have become eligible for migration since the last time reconciliation was run. If you want to be sure that all eligible files are listed in the migration candidates list before you start threshold migration, build a new list first.

For instructions to build a new migration candidates list, see “Building a New Migration Candidates List” on page 60.

To start threshold migration for one or more file systems, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. In the Space Manager window, select the file systems for which you want to start threshold migration by clicking on them.

3. Click on the **Selected** menu; **Start Threshold Migration** item.

The Threshold Migration Status window appears.

If you selected more than one file system, HSM displays a window for each file system. The windows are arranged in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. Click on **Close** to close the Threshold Migration Status window.

### Notes

- If you click on **Stop** in the Threshold Migration Status window, HSM stops the migration process. Any files that have been successfully migrated remain in a migrated state.
- If there are additional files that are eligible for migration, and the premigration percentage set for the file system has not been exceeded, HSM premigrates additional

files after the threshold migration process is complete. The status of the pre-migration process is displayed in the Threshold Migration Status window.

#### Using a Command

You can also use the **dsmautomig** command to start threshold migration for a file system. For example, to start threshold migration for the **/home** file system, enter:

```
dsmautomig /home
```

For detailed information about that command, see “dsmautomig — Starting Threshold Migration” on page 113.

## Starting Reconciliation Manually

HSM automatically reconciles each file system for which space management is active. You can also start reconciliation for one or more file systems yourself.

For example, if a user recalls a large number of migrated files, modifies them, and then selectively migrates them back to ADSM storage, two copies of each file reside in ADSM storage. The first copy of each file is now obsolete. If the MIGFILEEXPIRATION option is set to 0, you can choose to run reconciliation right away to delete the obsolete copies from ADSM storage and make additional space available for migrated files.

The reconciliation process performs the tasks described in Figure 21.

Figure 21 (Page 1 of 2). Reconciliation Tasks

Objects	Actions
Migrated files	<ul style="list-style-type: none"> <li>• Marks a migrated file for expiration if:               <ul style="list-style-type: none"> <li>– The stub file was deleted from the local file system</li> <li>– The file was recalled and modified</li> </ul> </li> <li>• Removes a migrated file from ADSM storage if it has expired based on the number of days set with the MIGFILEEXPIRATION option.</li> </ul>
Premigrated files	<ul style="list-style-type: none"> <li>• Marks a premigrated file for expiration if:               <ul style="list-style-type: none"> <li>– The file was deleted from the local file system</li> <li>– The file was accessed and modified</li> </ul> </li> <li>• Removes a copy of a premigrated file from ADSM storage if it has expired based on the number of days set with the MIGFILEEXPIRATION option.</li> </ul>

Figure 21 (Page 2 of 2). Reconciliation Tasks

Objects	Actions
Stub files	<ul style="list-style-type: none"> <li>Records, in the <b>orphan.stubs</b> file, the name of any file for which a stub file exists on the local file system, but no migrated file exists in ADSM storage.</li> </ul> <p>This can happen if, for example, you change the name of the server your client node contacts for space management services in your client system options file after files have been migrated to a previously specified server.</p>
Premigrated files database	<ul style="list-style-type: none"> <li>Deletes invalid entries from the premigrated files database.</li> <li>Completes the reorganization process if processing was interrupted the last time HSM attempted to reorganize the premigrated files database stored in the <b>.SpaceMan</b> directory.</li> <li>Clears the database if the premigrated files database is corrupted. All previously premigrated files become resident files.</li> </ul>
Status file	<p>Updates the following information in the <b>status</b> file:</p> <ul style="list-style-type: none"> <li>Number of premigrated files</li> <li>Number of blocks premigrated</li> <li>Number of migrated files</li> <li>Number of blocks migrated</li> </ul> <p><b>Note:</b> Only migration and recall processes update status information dynamically. If the state of a file is changed by any other process, the change is not reflected in the status file (and thus, in information displayed about a file system) until reconciliation is run.</p> <p>For example, if you restore a backup version of a migrated file, the file becomes resident; however, the number of migrated files and number of blocks migrated are not updated until reconciliation is run.</p> <p>Or, if you use the <b>touch</b> command or any other command that changes the ctime for a premigrated file, the file becomes resident; but the number of premigrated files and the number of blocks premigrated are not updated until reconciliation is run.</p>
Migration candidates list	Builds a new migration candidates list.

How often HSM automatically runs reconciliation depends on the setting for the **RECONCILEINTERVAL** option in your client system options file. The default is every 24 hours. HSM also runs reconciliation automatically before performing threshold migration if the migration candidates list for a file system is empty.

If you start reconciliation manually, you can perform all of the reconciliation tasks, synchronize the client and server only, or build a new migration candidates list only.

## Performing All Reconciliation Tasks

To start reconciliation for one or more file systems and perform all reconciliation tasks, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. In the Space Manager window, select the file systems you want to reconcile by clicking on them.
3. Click on the **Selected** menu; **Reconcile (Synchronize and Build)** item.

The Reconcile window shown in Figure 22 appears. The check buttons for both **Synchronize Client and Server** and **Build a Migration Candidates List** are selected.

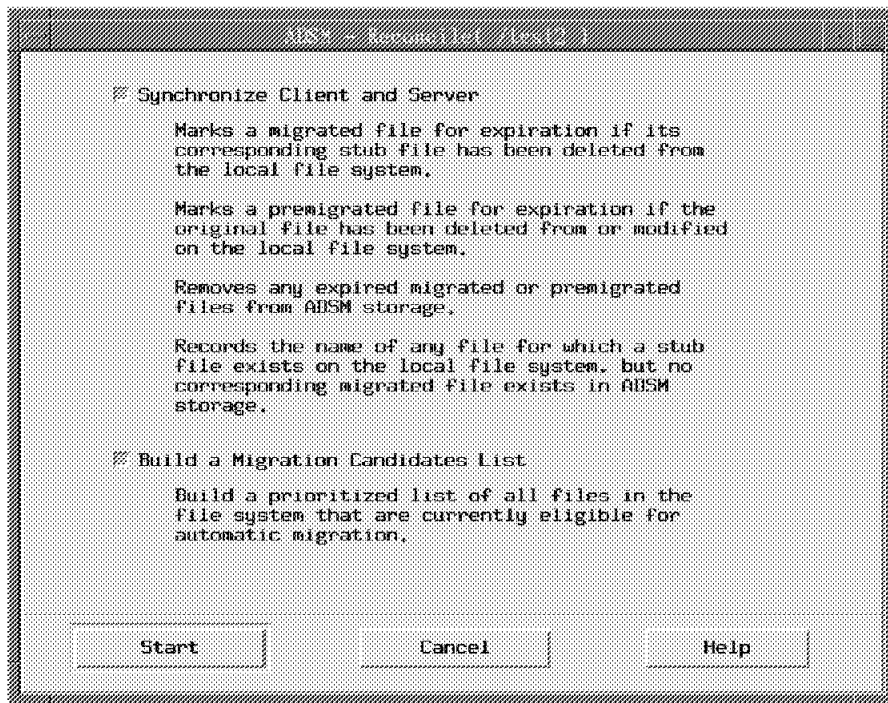


Figure 22. Reconcile Window

If you selected more than one file system, HSM displays a window for each one and arranges them in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. Click on **Start** to begin reconciling the file system you selected.

The Reconcile Status window shown in Figure 23 appears.

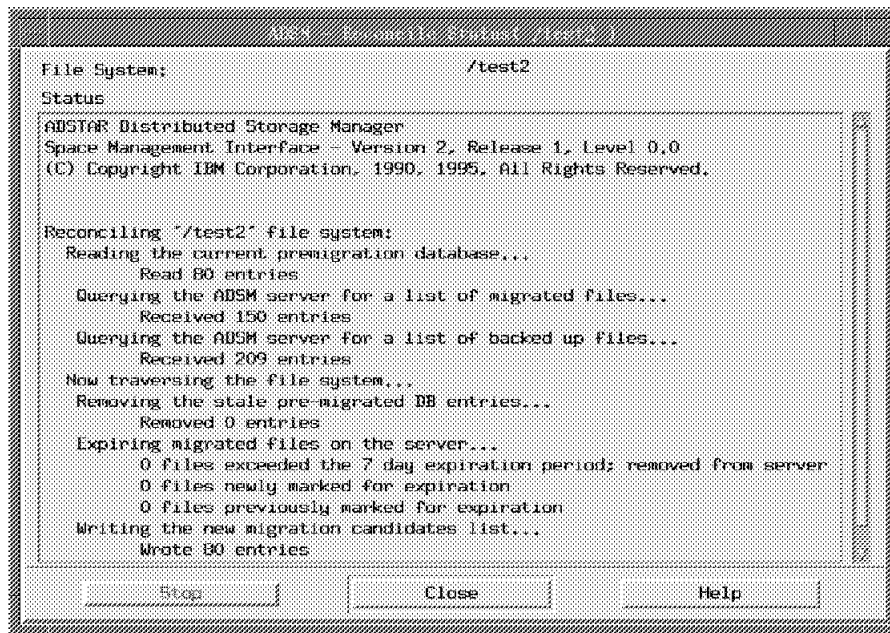


Figure 23. Reconcile Status Window

5. Click on **Close** to close the Reconcile Status window.

#### Notes

- If you click on **Stop** in the Reconcile Status window, the file system might not be fully synchronized, or the migration candidates list might not be fully built. The file system is not fully reconciled until you run reconciliation again, or it is run automatically by HSM.
- After you run reconciliation, check the **orphan.stubs** file in the **.SpaceMan** directory for each file system you reconciled to see whether any orphaned stub files were found.  
If file names are listed in the **orphan.stubs** file, see "Resolving Orphaned Stub Files" on page 62.
- To view the migration candidates list for a file system, click on the file system in the Space Manager window, and then click on the **Selected** menu; **Display Migration Candidates List** item.



### Using a Command

You can also use the **dsmreconcile** command to reconcile a file system. For example, to reconcile the **/home** file system, enter:

```
dsmreconcile /home
```

For detailed information about that command, see “dsmreconcile — Reconciling a File System” on page 153

## Synchronizing Your Client and Server

To perform all reconciliation tasks except building a new migration candidates list, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. In the Space Manager window, select the file systems you want to synchronize by clicking on them.
3. Click on the **Selected** menu; **Synchronize Client and Server** item.

The Reconcile Status window appears.

If you selected more than one file system, HSM displays a window for each one and arranges them in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. Click on **Close** to close the Reconcile Status window.

### Notes

- If you click on **Stop** in the Reconcile Status window, the file system is not fully synchronized until you run **Synchronize Client and Server** again, run all reconciliation tasks manually, or reconciliation is run automatically by HSM.
- After you run **Synchronize Client and Server**, check the **orphan.stubs** file in the **.SpaceMan** directory for each file system you reconciled to see whether any orphaned stub files were found.

If file names are listed in the **orphan.stubs** file, see “Resolving Orphaned Stub Files” on page 62.

### Using a Command

You can also use the **dsmreconcile** command to perform all reconciliation tasks except building a migration candidates list. For example, to synchronize the **/home** file system, enter:

```
dsmreconcile -f /home
```

For detailed information about that command, see “dsmreconcile — Reconciling a File System” on page 153

## Building a New Migration Candidates List

You can build a new migration candidates list without performing other reconciliation tasks. The following sections explain how HSM determines which files are listed in a migration candidates list, and how it determines the order in which the files are migrated.

### Determining Which Files Are Eligible for Automatic Migration

A file becomes a candidate for automatic migration when it meets the following criteria:

- It is a regular file
  - HSM does not migrate character special files, block special files, FIFO special files (named pipe files), or directories.
- It is a resident or premigrated file on a file system to which space management has been added
- It is not excluded from space management with an EXCLUDE or EXCLUDE.SPACEMGMT option in your include-exclude options file
- Its size is greater than both the size specified for stub files plus one byte and the file system block size.
- It meets the following management class requirements:
  - The management class assigned to the file allows automatic migration
  - The file has not been accessed for at least the number of days specified in the management class
  - A current backup version of the file, created using the ADSM backup-archive client, exists on your migration server if the management class specifies that one is required

**Note:** For hardlinked files, if any file in a set of hardlinked files is not excluded from space management and is assigned a management class that allows automatic or selective migration, the contents of the file can be migrated.

### Determining the Order in Which Files Are Migrated

HSM prioritizes files for automatic migration based on the number of days since they were last accessed, their size, and the age and size factors specified for a file system. To determine migration priority, HSM multiplies the number of days since a file was last

accessed by the age factor, and multiplies the size of the file in 1-KB blocks by the size factor. Then, it adds the products of those two calculations to produce a priority score. It prioritizes files for automatic migration in descending order by priority score.

For more detailed information about how HSM prioritizes files, refer to “Age and Size Factors” on page 40.

### Building the List

To build a new migration candidates list for a file system, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The ADSM Space Manager window appears.

2. In the Space Manager window, select the file systems for which you want to build a migration candidates list.

3. Click on the **Selected** menu; **Build Migration Candidates List** item.

The Reconcile Status window appears.

If you selected more than one file system, HSM displays a window for each one and arranges them in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. Click on **Close** to close the Reconcile Status window.

### Notes

- If you click on **Stop** in the Reconcile Status window, the migration candidates list is not updated.
- To view a migration candidates list for a file system, select the file system in the Space Manager window, and then click on the **Selected** menu; **Display Migration Candidates List** item.
- You can also build a migration candidates list for a file system from the Display Migration Candidates List window.

#### Using a Command

You can also use the **dsmreconcile** command to build a new migration candidates list. For example, to build a migration candidates list for the **/home** file system, enter:

```
dsmreconcile -c /home
```

For detailed information about that command, see “dsmreconcile — Reconciling a File System” on page 153

## Resolving Orphaned Stub Files

An *orphaned stub file* is a stub file for which no corresponding migrated file is found in ADSM storage. If orphaned stub files exist in a file system, HSM records information about those files in the **orphan.stubs** file during reconciliation. If you have set the ERRORPROG option in your client system options file, HSM also sends a message to the program specified with that option when it runs reconciliation automatically.

The following are some possible situations in which stub files could become orphaned:

- You modify your client system options file so that your client node contacts a different ADSM server for space management services than the one to which the files were migrated.

To resolve that problem, modify your client system options file so that your client node contacts the server to which the files were migrated.

- Your ADSM administrator uses the **delete filespace** administrator command to delete files migrated from a particular file system.

An administrator can delete some or all of the files in a file space in ADSM storage if those files are no longer needed.

In this case, the stub files are no longer valid and can be erased.

- A media failure occurs that causes the migrated files to be corrupted or lost.

ADSM provides protection against media failures through storage pool backup and recovery. However, if a situation should occur in which a migrated file cannot be obtained from a migration storage pool, you can restore backup versions of the files if you have created them using the ADSM backup-archive client. When you restore a backup version of a migrated file, the file becomes a normal, resident file.

---

## Starting the Space Monitor Daemon

The *space monitor daemon* is a program that monitors space usage on all file systems to which you add space management.

It checks space usage on your file systems as often as specified with the CHECKTHRESHOLDS option in your client system options file, and starts threshold migration whenever necessary. In addition, it starts reconciliation for your file systems at the intervals specified with the RECONCILEINTERVAL option in your client system options file.

The space monitor daemon is started automatically when you start your operating system. However, if for any reason the space monitor daemon stops running, you can start it by issuing the **dsmonitor** command.

---

## Starting a Recall Daemon

A *recall daemon* is a program that recalls a migrated file from ADSM storage back to a local file system. A recall daemon can only recall one file at a time. However, you can run more than one recall daemon at the same time.

You can set the minimum and maximum number of recall daemons that can run at one time using the MINRECALLDAEMONS and MAXRECALLDAEMONS options in your client system options file.

The minimum number of recall daemons that can run at one time is one. The default is three. The maximum number of recall daemons you want to run at one time depends on the number of concurrent recalls that normally occur on your system. If all recall daemons are busy, another file cannot be recalled until a recall daemon is available.

Recall daemons are started automatically. However, if for any reason, no recall daemons are running, you can start one yourself by issuing the **dsmrecalld** command.

---

## Setting Up Central Scheduling

Your ADSM administrator can set up central scheduling to perform backup, archive, and space management tasks automatically at specified intervals or at specific times. Central scheduling requires a cooperative effort between an ADSM server and your client node.

An ADSM administrator defines a schedule on the server and associates your client node with that schedule. For example, your administrator can define a schedule to reconcile all eligible file systems at 6:00 P.M. each day.

In addition, your administrator sets server parameters to:

- Balance scheduled services for all client nodes
- Specify whether your client node can query the server for scheduled work at specific time intervals or must wait for the server to contact your client node when it is time to perform scheduled services
- Control how often your client node contacts the server for scheduled work

Before scheduled work can be performed, you must:

- Set scheduling options in your client system options file if the default values are not appropriate
- Start a client scheduler on your workstation

You must have the ADSM backup-archive command-line client installed in order to start the client scheduler.

You can also display information about scheduled services.

## Setting Scheduling Options

The scheduling options you can set in your client system options file are listed in Figure 24.

Figure 24. Scheduling Options Set in Your Client System Options File

Option	Description	Default
MAXCMDRETRIES	Determines the maximum number of times the client scheduler attempts to process a scheduled command that fails.	2
POSTSCHEDULECMD	Specifies a command to process after running a schedule.	None
PRESCHEDULECMD	Specifies a command to process before running a schedule.	None
QUERYSCHEDPERIOD	Determines the number of hours the client scheduler waits between attempts to contact the server for scheduled work. Used only when the SCHEDMODE option is set to POLLING.	12
RETRYPERIOD	Determines the number of minutes the client scheduler waits between attempts to process a scheduled command that fails or between unsuccessful attempts to report results to the server.	20
SCHEDLOGNAME	Specifies the name of the file where ADSM logs information about scheduled work.	<b>dsmsched.log</b>
SCHEDLOGRETENTION	Specifies the number of days to keep entries in <b>dsmsched.log</b> and whether to save pruned entries.	Indefinitely
SCHEDMODE	Determines whether your client node contacts an ADSM server for scheduled services (client-polling) or waits to be contacted by the server when it is time to perform scheduled services (server-prompted).	POLLING
TCPCLIENTADDRESS	Specifies the TCP/IP address of your client node. Used only when the SCHEDMODE option is set to PROMPTED.	None
TCPCLIENTPORT	Specifies the TCP/IP port number for your client node. Used only when the SCHEDMODE option is set to PROMPTED.	1501

For detailed information about setting those options in your client system options file, see *ADSTAR Distributed Storage Manager Installing the Clients*.

## Starting the Client Scheduler

The client scheduler must be running on your workstation before any scheduled work can be started. You start the client scheduler by issuing the SCHEDULE command provided with the ADSM backup-archive client.

For detailed information about how to start the client scheduler, see *ADSTAR Distributed Storage Manager Using the UNIX Backup-Archive Clients*.

You can choose to start the client scheduler at any appropriate time. After you start the client scheduler, it runs continuously until you close the window in which you issued the command, kill the process, or log out of your system.

## Displaying Information About Scheduled Services

You can display information about work that is scheduled to be performed, and you can display information about completed work.

### Displaying Schedule Information

To display detailed information about all scheduled services for your client node, issue the following command:

```
dsmc query schedule
```

That command is provided with the ADSM backup-archive client. For more detailed information about the **dsmc query schedule** command, see *ADSTAR Distributed Storage Manager Using the UNIX Backup-Archive Clients*.

### Displaying Information About Completed Work

When you run the **dsmc schedule** command in the foreground, output from scheduled commands appears on your screen. The output is also directed to a file named **dsmsched.log** in the current directory unless you change the path and file name with the SCHEDLOGNAME option in your client system options file.

When you run the **dsmc schedule** command in the background, output is directed to the **dsmsched.log** file.

After scheduled services are performed, you can check the schedule log to determine whether all work completed successfully.

---

## Changing Your Password

If an ADSM password is required, and ADSM HSM is installed on your client node, the PASSWORDACCESS option in your client system options file must be set to GENERATE. That means that ADSM encrypts and stores your password locally and automatically generates a new ADSM password for your client node each time it expires. Users are not prompted for an ADSM password.

You can set the MAILPROG option in your client system options file to instruct ADSM to send you the password each time it generates a new one. If you know the current password, you can change it yourself if necessary.

If a migration server is specified with the MIGRATESERVER option in your client system options file, the password you set applies to that server.

If a default server is specified with the DEFAULTSERVER option in your client system options file, and a migration server is not specified with the MIGRATESERVER option, the password you set applies to the server specified with the DEFAULTSERVER option.

If no migration server or default server is specified using the MIGRATESERVER option or the DEFAULTSERVER option, the password you set applies to the server specified in the first stanza of your client system options file.

**Note:** ADSM uses the same password for both the ADSM backup-archive client and the ADSM HSM client when both clients contact the same ADSM server. Only one ADSM password is required for each ADSM server your client node contacts for services.

To change your ADSM password, follow these steps:

1. On any ADSM HSM window that contains a menu bar, click on the **Utilities** menu; **Change Password** item.

The Change Password window appears.

2. In the Change Password window:
  - a. Type your current ADSM password in the **Current password** field.
  - b. Type a new password in the **New password** field.
  - c. Type the new password again in the **Re-enter new password** field.
3. Click on **OK**.

ADSM updates your password for the ADSM server your client node contacts for space management services.

#### Using a Command

You can also use the **dsmsetpw** command to change your ADSM password. For example:

```
dsmsetpw oldpw newpw
```

For detailed information about that command, see “dsmsetpw — Changing Your Password” on page 157.



---

## Chapter 4. Migrating and Recalling Selected Files

HSM automatically migrates files to ADSM storage when space is needed on a local file system, and automatically recalls migrated files when you access them. However, you can choose to migrate and recall files yourself at any time.

For example, you just finished a project, and the files associated with it take up a significant amount of space on your local file system. You do not want to archive the files just yet because you might need information from some of them for your next project.

When HSM runs threshold migration, the files are not migrated because their date of last access makes them ineligible for migration. You can use selective migration to move the files to ADSM storage right away and make space for your new project files.

After you start your new project, you find you need all of the files in a particular directory from the old project. Rather than allowing HSM to recall the files as you access each one, you can use selective recall to bring them all back to your local file system.

When you use selective recall, HSM recalls your files in the fastest, most efficient order based on where they are stored.

---

### Migrating Selected Files

If you are a root user, you can selectively migrate any file on your workstation that is eligible for selective migration. If you are a user, you can selectively migrate any file you own that is eligible for selective migration. Note that when you selectively migrate a file, the access time (atime) for the file is not changed.

A file is eligible for selective migration if it meets the following criteria:

- It is a regular file
  - HSM does not migrate character special files, block special files, FIFO special files (named pipe files), or directories.
- It is a resident or premigrated file on a file system for which space management is active
- It is not excluded from space management with an EXCLUDE or EXCLUDE.SPACEMGMT option in your include-exclude options file
- Its size is greater than both the size specified for stub files plus one byte and the file system block size
- It meets the following management class requirements:
  - The management class assigned to the file allows selective migration
  - A current backup version of the file, created using the ADSM backup-archive client, exists on your migration server if the management class specifies that one is required

HSM does not check the number of days since a file was last accessed for selective migration.

**Note:** For hardlinked files, if any file in a set of hardlinked files is not excluded from space management and is assigned to a management class that allows automatic or selective migration, the contents of the file can be migrated.

To migrate selected files from a local file system to ADSM storage, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Selective Migration** push button.

The Selective Migration window shown in Figure 25 appears.



Figure 25. Selective Migration Window

If you have not previously selected a file system, the Select File Systems for Selective Migration window shown in Figure 26 on page 69 also appears.

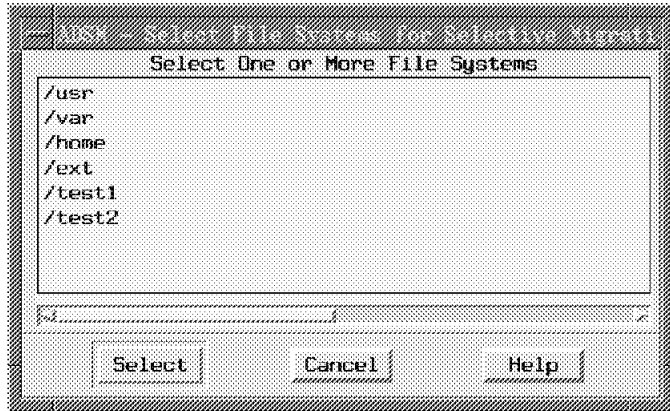


Figure 26. Select File Systems for Selective Migration Window

If the Select File Systems for Selective Migration window does not appear, and you want to select a different file system, click on **Select File Systems** in the Selective Migration window.

2. In the Select File Systems for Selective Migration window, select the file systems that contain the files you want to migrate.
3. Click on **Select**.

A directory tree of the file systems you selected appears in the Directory Tree View in the Selective Migration window.

4. Select the files you want to migrate using one of the following methods:
  - To select all files in a directory, select the **Select All Files in A Directory** check button, and then select one or more directories.
  - To select all files in all subdirectories, select the **Select All Files in All Subdirectories** check button, and then select one or more directories.
  - To select individual files, ensure that both the **Select All Files in A Directory** and the **Select All Files in All Subdirectories** check buttons are deselected. Then, select a directory and highlight the files you want to migrate in the File List View portion of the window.

5. Click on **Migrate** after you finish selecting the files you want to migrate.

The Selective Migration Status window shown in Figure 27 on page 70 appears.

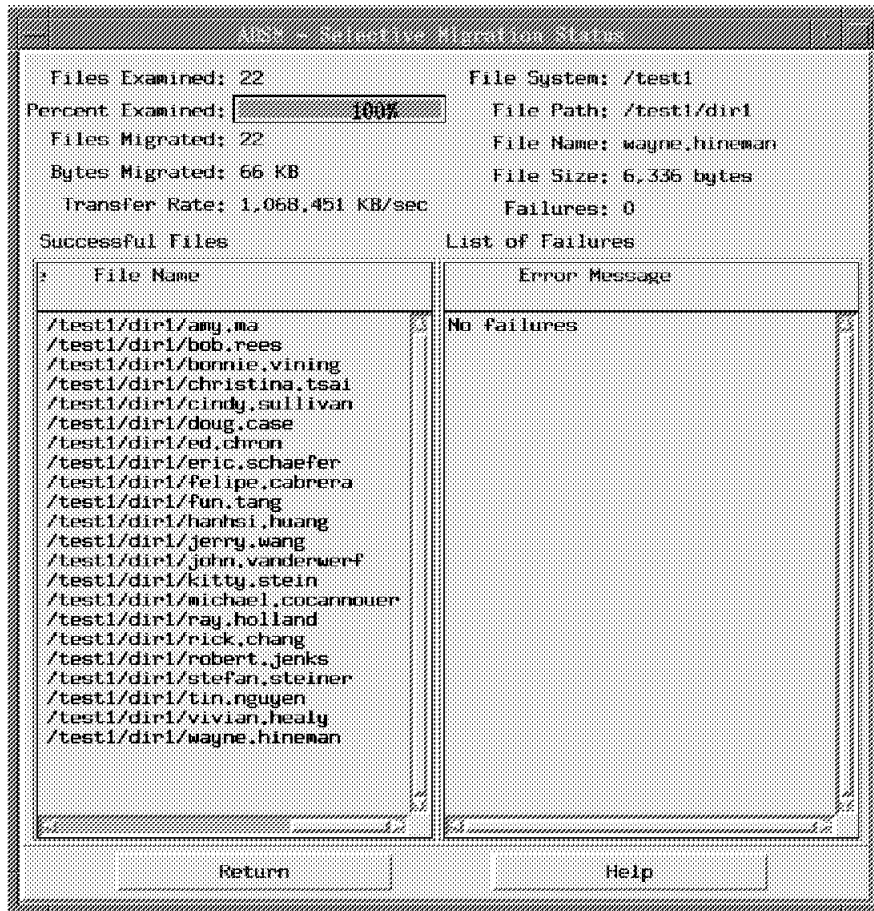


Figure 27. Selective Migration Status Window

**Note:** If the TAPEPROMPT option in your client user options file is set to Yes, and the destination for a migrated file (specified in the management class assigned to the file) is a storage pool that consists of removable media, such as tape, HSM prompts you for whether you want to wait for the medium to be mounted or skip the file.

While HSM is migrating files, a **Stop** push button appears at the bottom of the window. Click on **Stop** if you want HSM to stop migrating files.

When HSM finishes migrating all selected files, or when you click on **Stop**, a **Return** push button appears at the bottom of the window.

In addition, when HSM finishes migrating all selected files, an Information Dialog window appears to inform you that all files have been migrated. Click on **OK** to close the Information Dialog window.

6. Click on **Return** to go back to the Selective Migration window.

7. Click on **Cancel** to close the Selective Migration window.

**Notes:**

- HSM displays only resident and premigrated files in the File List View by default. If you want to display migrated files, click on the **View** menu; **View options** item.
- If you want to see a list of the files you selected before you start the migration process, click on **List Selection** in the Selective Migration window.
- If you click on **Stop** in the Selective Migration Status window, any files already migrated remain in a migrated state.

**Using a Command**

You can also use the **dsmmigrate** command to migrate one or more files to ADSM storage. For example, to migrate a file named **proj1rpt** from the **/home/proja** directory, enter:

```
dsmmigrate /home/proja/proj1rpt
```

For detailed information about that command, see “dsmmigrate — Migrating Selected Files” on page 138.

---

## Recalling Selected Files

If you are a root user, you can selectively recall any file migrated from your workstation. If you are a user, you can selectively recall any file you have permission to access.

When you recall a file, HSM leaves the copy of the recalled file in ADSM storage intact. The file is then in a premigrated state because an identical copy exists both on your local file system and in ADSM storage.

If you do not modify the file, it remains in a premigrated state until it once again becomes eligible for migration and is changed to a migrated state. Note that when you selectively recall a migrated file, its access time (atime) is changed to the current time.

If you modify the file, it becomes a resident file. The next time the file system is reconciled, HSM marks the copy in ADSM storage for expiration.

**Note:** Selective recall overrides the recall mode set for a migrated file if the recall mode is set to migrate-on-close or read-without-recall. You can selectively recall a file regardless of the recall mode set for the file.

To recall one or more selected files, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Selective Recall** push button.

The Selective Recall window shown in Figure 28 on page 72 appears.



Figure 28. Selective Recall Window

If you have not previously selected a file system, the Select File Systems for Selective Recall window shown in Figure 29 on page 73 also appears.

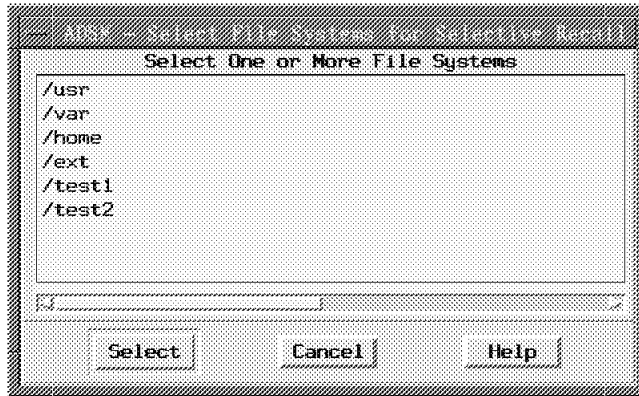


Figure 29. Select File Systems for Selective Recall Window

If the Select File Systems for Selective Recall window does not appear, and you want to select a different file system, click on **Select File Systems** in the Selective Recall window.

2. In the Select File Systems for Selective Recall window, select the file systems that contain the files you want to recall.
3. Click on **Select** to select the file systems.

A directory tree of the file systems you selected appears in the Directory Tree View on the Selective Recall window.

4. Select the files you want to recall using one of the following methods:
  - To select all files in a directory, select the **Select All Files in A Directory** check button, and then select one or more directories.
  - To select all files in all subdirectories, select the **Select All Files in All Subdirectories** check button, and then select one or more directories.
  - To select individual files, ensure that the **Select All Files in A Directory** and the **Select All Files in All Subdirectories** check buttons are deselected. Then, select a directory and highlight the files you want to recall in the File List View portion of the window.
5. Click on **Recall** to begin recalling the files you selected.

The Selective Recall Status window shown in Figure 30 on page 74 appears.

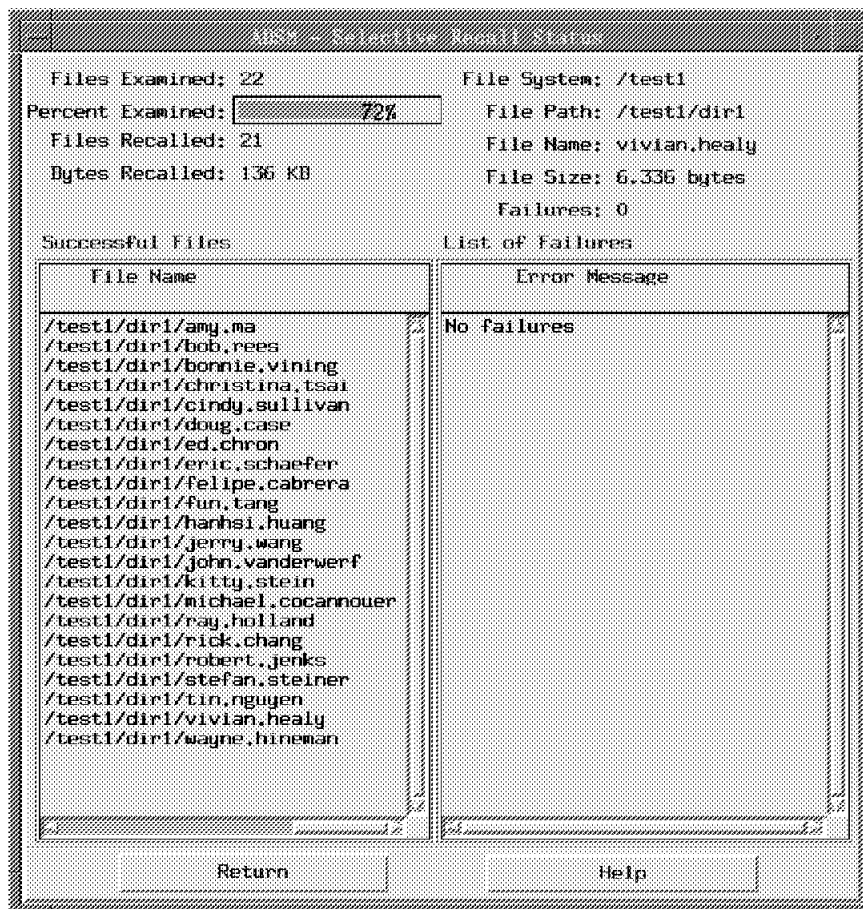


Figure 30. Selective Recall Status Window

While HSM is recalling files, a **Stop** push button appears at the bottom of the window. Click on **Stop** if you want HSM to stop recalling files.

When HSM finishes recalling all selected files, or when you click on **Stop**, a **Return** push button appears at the bottom of the window.

In addition, when HSM finishes recalling all selected files, an Information Dialog window appears to inform you that all files have been recalled. To close the Information Dialog window, click on **OK**.

6. In the Selective Recall Status window, click on **Return** to go back to the Selective Recall window.
7. Click on **Cancel** to close the Selective Recall window.

**Notes:**



- HSM displays only migrated files in the File List View by default. If you want to display premigrated and resident files, click on the **View** menu; **View options** item.
- If you want to see a list of only those files you selected before you start recalling the files, click on **List Selection** in the Selective Recall window.
- If you click on **Stop** in the Selective Recall Status window, any files already recalled remain on your local file system in a premigrated state.

#### Using a Command

You can also use the **dsmrecall** command to recall one or more files from ADSM storage. For example, to recall a file named **proj1rpt** from the **/home/proja** directory, enter:

```
dsmrecall /home/proja/proj1rpt
```

For detailed information about that command, see “dsmrecall — Recalling Selected Files” on page 150.



## Chapter 5. Displaying Space Management Information

You can display the following types of information:

- Space management related information about your file systems
- The current migration candidates list for a file system
- Information about management classes you can assign to files
- Information about client and server options

### Displaying Information About Your File Systems

You can display space management related information about each of your file systems in a list format or a pie chart format.

To display information about your file systems, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window shown in Figure 31 appears.

The screenshot shows the 'Space Manager' window with a menu bar (File, Selected, Edit, View, Utilities, Window, Help) and a status bar (Last Refresh: 5/16/95 10:56:26, Refresh Interval: 0 Minute). The main table displays the following data:

File System	Local Free Space (KB)	Local Resident Space (KB)	Local Premigrated Space (KB)	Server Free Space (MB)
/ext	7,788	618,900	0	0
/home	568	150,984	0	0
/test1	4,124	12,260	0	16
/test2	4,140	12,236	0	0
/usr	7,748	246,204	0	0
/var	1,856	14,528	0	0

Below the table, there is a section titled 'Select a push button to go to the desired column.' with the following options:

Local Free Space	Number of Resident Inodes	Low Threshold
Local Resident Space	Number of Migrated Files (St)	Premigration Percentage
Local Premigrated Space	Age Factor	File System Type
Server Free Space	Size Factor	Percent Usage
Server Migrated Space	Quota	Capacity
Number of Premigrated Files	High Threshold	File System State

At the bottom, there is a checkbox labeled 'Hide Scrolling Shortcuts'.

Figure 31. Space Manager Window

**Note:** Some column headings in the File System view might be truncated. To display the complete headings, specify a larger column width using the ADSM

Column Layout for Space Manager window. To open the Column Layout window, select the Column Layout menu choice from the View menu.

2. In the Space Manager window, you can:

- Use the scroll bar to scroll to the information you want to view
- Click on a Scrolling Shortcut push button at the bottom of the Space Manager window to go directly to a specific column of information
- Click on the **View** menu; **Column Layout** item to arrange the columns of information in a different order
- Click on the **View** menu; **Sort** item to sort information based on the values in a particular column
- Click on the **View** menu; **Refresh** or **Refresh Interval** item to have HSM refresh the information displayed once or periodically
- Click on the **Selected** menu; **View as Pie Chart** item to view information for a file system in a pie chart format

When you select the **View as Pie Chart** item from the **Selected** menu, the View as Pie Chart window shown in Figure 32 appears.

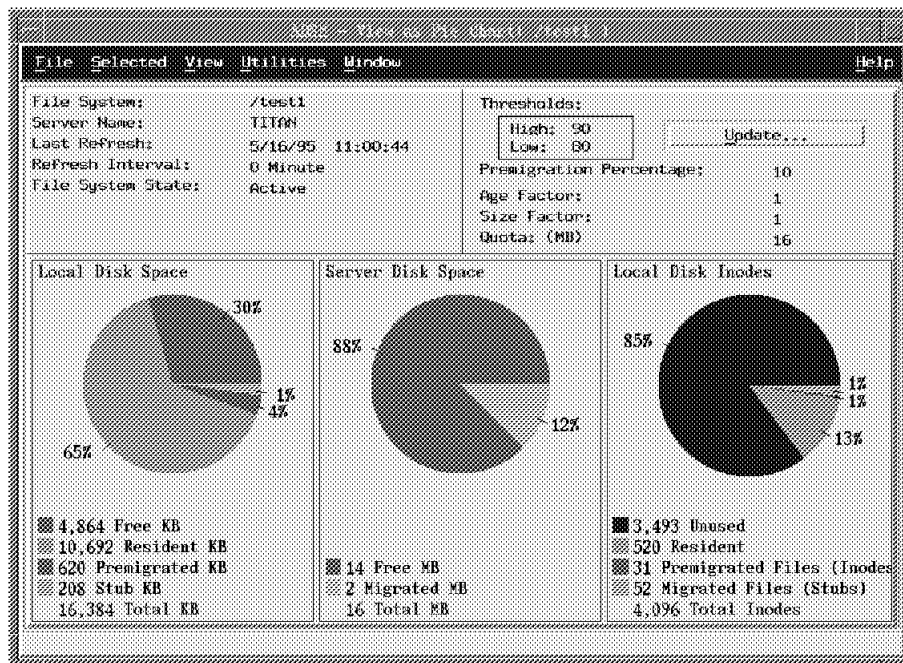


Figure 32. View as Pie Chart Window

In the View as Pie Chart window, you can select options from the **View** menu to have HSM refresh the information displayed for a file system once or periodically.

3. Click on the **File** menu; **Close** item to close the View as Pie Chart window.

**Note:** Only migration and recall update status information dynamically. If the state of a file is changed by any other process, the change is not reflected in the information displayed in the Space Manager or View as Pie Chart windows until reconciliation is run.

For example, if you restore a backup version of a migrated file, information displayed in the View as Pie Chart window for local disk space, server disk space, and local disk inodes does not reflect the change until reconciliation is run.

Or, if you use any command that changes the ctime of a premigrated file (which causes the file to become resident), that change is not reflected in status information until reconciliation is run.

#### Using a Command

You can also use the following commands to display space management related information about your file systems, files, and directories:

**dsmmigfs** Displays the current space management settings for a file system. For example, to display the space management settings for the **/home** file system, enter:

```
dsmmigfs query /home
```

**dsmdf** Displays space usage information for a file system. For example, to display space usage information for the **/home** file system, enter:

```
dsmdf /home
```

**dsmdu** Displays space usage information for files and directories. For example, to display space usage information for each file in the **/home/user/proj1** directory and in all of its subdirectories, enter:

```
dsmdu -Allfiles /home/user1/proj1
```

**dsmIs** Lists files in a directory and shows file states.

For example, to display information about all files in the **/home/user1** directory, enter:

```
dsmIs /home/user1/*
```

For detailed information about each of those commands, see “Hierarchical Storage Management Commands” on page 104.

---

## Displaying a Migration Candidates List

HSM builds a migration candidates list for each file system to which space management has been added.

To display the migration candidates list for a file system, follow these steps:

1. In the Hierarchical Storage Management window, click on the **Space Manager** push button.

The Space Manager window appears.

2. Select the file system for which you want to view a migration candidates list by clicking on them. You can select multiple file systems.

3. Click on the **Selected** menu; **Display Migration Candidates List** item.

The Display Migration Candidates List window shown in Figure 33 appears.

HSM displays the current migration candidates list. The files are arranged in the order in which they will be migrated.

File Name	Days Since Last Access	File Size	Priority Score	Projected Free Space
/test1/dir1/amy.ma	0	6336	6	8,095,774
/test1/dir1/dir2/dir3/dir4/dir5/ds	0	6414	6	8,102,188
/test1/dir1/tin.nguyen	0	6336	6	8,108,524
/test1/dir1/stefan.steiner	0	6336	6	8,114,860
/test1/dir1/robert.jerks	0	6336	6	8,121,196
/test1/dir1/dir2/dir3/ca.h	0	6189	6	8,127,532
/test1/dir1/dir2/dir3/dir4/highlev	0	6662	6	8,134,047
/test1/dir1/rick.chang	0	6336	6	8,140,383
/test1/dir1/ray.holland	0	6336	6	8,146,719
/test1/dir1/michael.cocannouer	0	6336	6	8,153,055
/test1/dir1/kitty.stein	0	6336	6	8,159,391
/test1/dir1/john.vandemaerf	0	6336	6	8,165,727
/test1/dir1/jerry.wang	0	6336	6	8,172,063
/test1/dir1/hanssi.huang	0	6336	6	8,178,399
/test1/dir1/hun.tang	0	6336	6	8,184,735
/test1/test1/test2/test3/3list.h	0	6457	6	8,191,147
/test1/dir1/felipe.cabrera	0	6336	6	8,197,528
/test1/dir1/eric.schaefer	0	6336	6	8,203,864
/test1/dir1/ad.chron	0	6336	6	8,210,200
/test1/dir1/doug.case	0	6336	6	8,216,536
/test1/dir1/cindy.sullivan	0	6336	6	8,222,872
/test1/dir1/christina.teal	0	6336	6	8,229,208
/test1/dir1/dir2/dir3/ernanes.h	0	6539	6	8,235,747

Figure 33. Display Migration Candidates List Window

If you selected more than one file system, HSM displays a window for each file system and arranges them in a cascade. Select the window you want to view. The name of the file system to which a window applies appears on the title bar.

4. In the Display Migration Candidates List window, you can:
  - Use the scroll bars to go to the information you want to view
  - Click on the **View** menu; **Column Layout** item to arrange the columns of information in a different order.
  - Click on items in the **Utilities** menu to display information about management classes or client and server options

### Using a command

You can also use the **dsmmigquery** command to display a migration candidates list. For example, to display the migration candidates list for the **/home** file system, enter:

```
dsmmigquery /home
```

For detailed information about that command, see “**dsmmigquery** — Displaying Space Management Information” on page 134.

---

## Displaying Information About Management Classes

One of the factors that determines whether a file is eligible for migration is the management class assigned to the file.

A root user on your workstation is responsible for assigning management classes to files using one or more **INCLUDE** options in an include-exclude options file. If a root user does not assign a specific management class to a file, ADSM uses a default management class.

When you follow the steps below, HSM displays information about the management classes available on the server your client node contacts for space management services only. If your client node contacts one or more additional ADSM servers for backup and archive services, you must use the ADSM backup-archive client graphical user interface or the **dsmc query mgmtclass** command to display information about management classes available on those servers.

To display information about the management classes that are available to assign to your files, follow these steps:

1. Click on the **Utilities** menu; **Display Policy Information** item in any ADSM HSM window that displays a menu bar.

The Display Policy Information window shown in Figure 34 on page 82 appears.

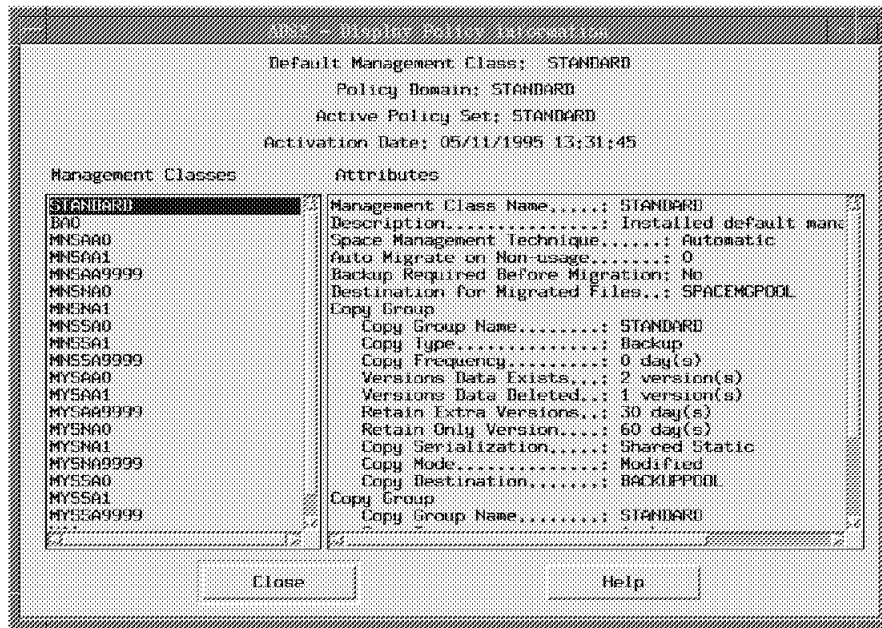


Figure 34. Display Policy Information Window

2. Click on the management class for which you want to display information in the Management Classes box.  
To display descriptions of management class attributes, click on **Help**.
3. To close the Display Policy Information window, click on **Close**.

#### Using a command

You can also use the **dsmmigquery** command to display information about management classes. For example, to display detailed information about each management class you can assign to files, enter:

```
dsmmigquery -mgmtclass -detail
```

For detailed information about that command, see “dsmmigquery — Displaying Space Management Information” on page 134.

## Displaying Client and Server Options

Client and server options affect how your client node communicates with an ADSM server and how ADSM processes your sessions with an ADSM server. Some options also affect certain aspects of backup, archive, and space management processes.

For information about how to change a client option, see *ADSTAR Distributed Storage Manager Installing the Clients*.



To display information about client and server options, follow these steps:

1. Click on the **Utilities** menu; **Display Options** item in any ADSM HSM window that displays a menu bar.

The Display Options window shown in Figure 35 appears.

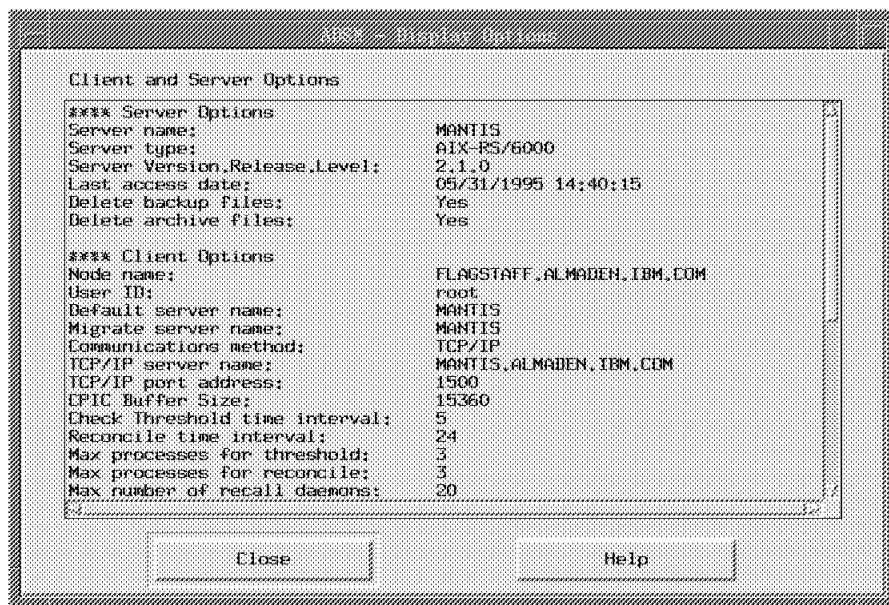


Figure 35. Display Options Window

2. In the Display Options window, use the scroll bars to view the list of options.  
To display descriptions of client and server options, click on **Help**.
3. To close the Display Options window, click on **Close**.

#### Using a command

You can also use the **dsmmigquery** command to display information about client and server options. To display that information, enter:

```
dsmmigquery -options
```

For detailed information about that command, see “dsmmigquery — Displaying Space Management Information” on page 134.



---

## Chapter 6. Backing Up and Restoring Migrated and Premigrated Files

Backing up your files protects against accidental or intentional corruption or loss of your data. You should back up all of your important files regularly, regardless of whether they are resident, migrated, or premigrated.

Using the ADSM backup-archive client, you can back up and restore migrated and premigrated files in the same way as you back up and restore files that reside only on your local file systems (see *Using the UNIX Backup-Archive Clients* for detailed information about how to back up and restore files).

In addition, if you back up and migrate files to the same server, you can use the ADSM backup-archive client to restore stub files for migrated and premigrated files instead of restoring the contents of the files. This is especially useful if one or more of your local file systems is damaged or lost. In that case, the migrated files are still intact, and you need to restore only the stub files.

If you back up and migrate files to different servers, or if backup versions do not exist for some migrated or premigrated files, you can use an HSM command to recreate stub files for migrated files and create new stub files for premigrated files if necessary.

The following sections discuss these topics:

- Backing up, migrating, and restoring files
- Backing up and restoring premigrated files
- Recreating stub files for migrated files
- Restoring an entire file system
- Restoring a disk in case of disk loss

---

### Backing Up, Migrating, and Restoring Files

This section discusses considerations for backing up and migrating files to the same server and to different servers.

#### Backing Up and Migrating Files to the Same Server

Backing up and migrating files to the same ADSM server has the following advantages:

- HSM can verify whether current backup versions of files exist before migrating them
- You can use an option with the ADSM backup-archive client to restore stub files for migrated files and premigrated files instead of restoring backup versions of the files

You can also use the ADSM HSM client **dsmmigundelete** command to recreate stub files for any migrated or premigrated files that are not backed up.

## Backing Up Files Before Migrating Them

If you back up and migrate files to the same ADSM server, a root user can assign a management class to files that specifies that current backup versions of the files (created using the ADSM backup-archive client) must exist on your migration server before the files can be migrated. The default management class delivered with ADSM includes that requirement.

HSM checks for backup versions of files only on the server to which it migrates your files. If a current backup version of a file does not exist on that server, the file is not migrated.

## Backing Up Files After Migrating Them

If files are assigned a management class that does not include the requirement for an existing backup version, you can still back up the files after they are migrated.

If you back up the files to the same ADSM server to which they were migrated, ADSM copies the file from the migration destination to the backup destination. It does not recall the files back to your local file system.

## Restoring Migrated Files

If you back up and migrate files to the same server, you can restore migrated files, if necessary, using one of the methods described in Figure 36.

---

*Figure 36 (Page 1 of 2). Methods of Restoring Migrated Files When Files are Backed up and Migrated to the Same Server*

---

Method	Description
Restore a backup version	<p>Use this method if the migrated file is lost or corrupted. You can restore the latest backup version of the file or an earlier version.</p> <p>When you restore a backup version of a migrated file to its original location, the file becomes a resident file. ADSM removes the migrated copy of the file from ADSM storage (if one exists) when it expires based on the number of days specified with the MIGFILEEXPIRATION option in your client system options file.</p>
Restore a stub file	<p>Use this method if only the stub file on the local file system is lost or corrupted, and you want the file to remain migrated.</p> <p>To restore a stub file for a migrated file, use the RESTOREMIGSTATE option. For more information about that option, see <i>Using the UNIX Backup-Archive Client</i>.</p>

---

Figure 36 (Page 2 of 2). Methods of Restoring Migrated Files When Files are Backed up and Migrated to the Same Server

Method	Description
Recreate a stub file	<p>Use this method if no backup version of the file exists.</p> <p>If a backup version of a migrated file does not exist, you cannot use the ADSM backup-archive client to restore a stub file for that file.</p> <p>To recreate stub files for migrated files, use the ADSM HSM client <b>dsmmigundelete</b> command. For more information about that command, see “Recreating Stub Files for Migrated Files” on page 89.</p>

## Backing Up and Migrating Files to Different Servers

The following are considerations when you back up files to one server and migrate files to another:

- HSM cannot verify that current backup versions of the files exist before migrating them
- ADSM cannot restore stub files for migrated files

If you back up files to one server and migrate them to another, you can use the ADSM backup-archive client to restore only the actual backup versions. You cannot use it to restore stub files for the migrated files. If stub files are lost, you must use the ADSM HSM client to recreate them.

### Backing Up Files Before Migrating Them

If you back up files to one server and migrate them to another, HSM cannot verify that current backup versions of the files exist before migrating them.

Any management class that a root user assigns to files that you want HSM to migrate *must* specify that current backup versions are not required prior to migration. Otherwise, the files cannot be migrated.

### Backing Up Files After Migrating Them

If you back up files after they are migrated, the ADSM backup-archive client accesses the files using:

- Migrate-on-close recall mode if the recall mode set for the file is normal or migrate-on-close.  
The file resides on your local file system only until ADSM finishes sending a backup version of the file to your backup server.
- Read-without-recall mode if the recall mode set for the file is read-without-recall.

For more information about recall modes, see “dsmattr — Setting or Displaying the Recall Modes for Migrated Files” on page 106.

## Restoring Migrated Files

If you back up files to a different server than the one to which you migrate them, you can restore migrated files using one of the methods described in Figure 37.

Figure 37. Methods of Restoring Migrated Files When Files are Backed Up and Migrated to Different Servers

Method	Description
Restore a backup version	<p>Use this method if the migrated file is lost or corrupted. You can restore the latest backup version of the file or an earlier version.</p> <p>When you restore a backup version of a migrated file to its original location, the file becomes a resident file. ADSM removes the migrated copy of the file from ADSM storage (if one exists) when it expires based on the number of days specified with the MIGFILEEXPIRATION option in your client system options file.</p>
Recreate a stub file	<p>Use this method if no backup version of the file exists, or only the stub file is lost or corrupted, and you want the file to remain migrated.</p> <p>When you back up and migrate files to different servers, you cannot use the ADSM backup-archive client to restore a stub file for a migrated file.</p> <p>To recreate a stub file for a migrated file, use the ADSM HSM client <b>dsmmigundelete</b> command. For more information about that command, see “Recreating Stub Files for Migrated Files” on page 89.</p>

## Backing Up and Restoring Premigrated Files

You can back up a premigrated file in the same way you back up a resident file.

Whether you back up a premigrated file to the same server to which it was premigrated or to a different server, ADSM sends a copy of the file from your local file system to ADSM storage. It does not copy the file from the migration destination to the backup destination.

If you back up and migrate files to the same server, you can:

- Restore backup versions of premigrated files
- Restore stub files for premigrated files using the RESTORE command (available with the ADSM backup-archive client)
- Create stub files for premigrated files using the **dsmmigundelete** command (available with the ADSM HSM client)

For more information about restoring backup versions and stub files for premigrated files, see *Using the UNIX Backup-Archive Clients*.

If you back up and migrate files to different servers, you can:

- Restore backup versions of premigrated files
- Create stub files for premigrated files

For more information about creating stub files for premigrated files, see “Recreating Stub Files for Migrated Files.”

---

## Recreating Stub Files for Migrated Files

HSM provides the following to allow you to recreate stub files if they are accidentally erased or corrupted:

- The MIGFILEEXPIRATION option
- The **dsmmigundelete** command

You need to use this method of restoring stub files only if:

- You back up and migrate files to different servers
- A backup version of a migrated file does not exist

If you back up and migrate files to the same server, and backup versions of the files exist, use the ADSM backup-archive client to restore stub files.

**Note:** When you use the **dsmmigundelete** command to recreate stub files for migrated files, HSM recreates stub files for all eligible migrated files in the file system you specify. You cannot use the command to recreate stub files for individual files or specific groups of files. In addition, HSM also creates stub files for all eligible premigrated files in the file system, thus making them migrated files.

## Using the MIGFILEEXPIRATION Option

A root user sets the MIGFILEEXPIRATION option in the client system options file. It affects both migrated and premigrated files.

The MIGFILEEXPIRATION option specifies the number of days HSM retains a migrated or premigrated file in ADSM storage after the stub file (in the case of a migrated file) or the original file (in the case of a premigrated file) is deleted from the local file system. If necessary, you can recreate stub files for any migrated files that have not expired, and create stub files for any premigrated files that have not expired.

The default setting for MIGFILEEXPIRATION is 7 days. The valid settings are 0 to 9999 days.

When you delete a stub file from a local file system, HSM marks the corresponding migrated file for expiration the next time reconciliation is run. Reconciliation is run automatically as often as specified with the RECONCILEINTERVAL option in the client system options file. The default is every 24 hours. A root user can also run reconciliation for a file system at any time.

A file that is marked for expiration during reconciliation is called an *expiring file*. Whether HSM recreates a stub file for an expiring file depends on the setting you choose for the EXPIRING option when you issue the **dsmmigundelete** command described next.

## Using the dsmmigundelete Command

If a user accidentally deletes stub files from a local file system, and the corresponding migrated files have not expired, a root user can recreate the stub files, if necessary, by issuing the **dsmmigundelete** command. When you issue the **dsmmigundelete** command, HSM also creates stub files for any premigrated files for which an original file does not exist on the local file system.

The **dsmmigundelete** command includes an EXPIRING option. The following sections discuss how the command works with and without that option.

### Without the EXPIRING Option

If you issue the **dsmmigundelete** command without the EXPIRING option, HSM does the following for the file system you specify:

- |                              |  |
|------------------------------|--|
| <b>For migrated files</b>    | Recreates a stub file for a migrated file if a corresponding stub file does not exist on the local file system, and the migrated file has <i>not</i> been marked for expiration.         |
| <b>For premigrated files</b> | Creates a stub file for a premigrated file if a corresponding original file does not exist on the local file system, and the premigrated file has <i>not</i> been marked for expiration. |

Issue the **dsmmigundelete** command without the EXPIRING option if reconciliation has not been run since the files were deleted.

For example, if a user accidentally deletes files from the **/home** file system, and those files are migrated, the stub files are missing, but the migrated files still exist in ADSM storage.

If the user notifies you right away, and reconciliation has not been run, issue:

```
dsmmigundelete /home
```

### With the EXPIRING Option

If you issue the **dsmmigundelete** command with the EXPIRING option, HSM does the following for the file system you specify:

- |                           |  |
|---------------------------|--|
| <b>For migrated files</b> | Recreates a stub file for a migrated file if a corresponding stub file does not exist on the local file system, whether the migrated file has been marked for expiration or not. |
|---------------------------|--|



**For premigrated files**            Creates a stub file for a premigrated file if a corresponding original file does not exist on the local file system, whether the premigrated file has been marked for expiration or not.

Issue the **dsmmigundelete** command with the EXPIRING option if reconciliation has been run since the files were deleted.

For example, if a user accidentally deletes all the files in a directory in the **/home** file system, and that directory contained migrated and premigrated files, the stub files and original copies of the files are missing, but the migrated and premigrated files still exist in ADSM storage.

If the user notifies you the next day (or any day within the expiration period specified with the MIGFILEEXPIRATION option in your client system options file), and reconciliation has been run for the file system since the files were deleted, issue:

```
dsmmigundelete -expiring /home
```

### Additional Considerations

Additional considerations for using the **dsmmigundelete** command include the following:

- If the name of a migrated or premigrated file in ADSM storage is the same as the name of a file that currently resides on your local file system, HSM replaces the file on your local file system with a stub file if the modification time (mtime) for the migrated or premigrated file is newer than the modification time for the file on your local file system.
- If there are multiple migrated files in ADSM storage that have been marked for expiration and have the same name, HSM recreates a stub file for the file with the most recent modification time.
- A stub file created by the **dsmmigundelete** command contains the information necessary to recall its corresponding migrated file. It does not contain any leading bytes of data from the migrated file.
- If the migrate-on-close or read-without-recall mode was set for the file, that mode is no longer set. The recall mode for the migrated file is normal.
- If a directory path does not exist for a migrated or premigrated file, HSM does not create a stub file for that file.
- If you rename a file after it is migrated, the file name is not updated on the ADSM server. When you use the **dsmmigundelete** command, HSM recreates a stub file with the name of the file at the time it was migrated.
- ADSM can recreate a stub file for a migrated file or create a stub file for a premigrated file even if:
  - The file was never backed up
  - The migrated or premigrated file resides on a different server than the server on which backup copies of the file reside

- The file was migrated or premigrated after the last incremental backup

**Attention**

The **dsmmigundelete** command does not support hardlinked files. If you attempt to recreate a stub file for a hardlinked file, a stub file is not recreated unless all of the files in a hardlinked set have been deleted from the local file system.

When one file in a set of hardlinked files is migrated, all of the hardlinked files in the set become stub files. When the **dsmmigundelete** command recreates a stub file for a hardlinked file, the stub file has the same name as the file that was originally migrated. Stub files are not recreated for any other files that were previously in the hardlinked set of files.

For more information about using the **dsmmigundelete** command, see “dsmmigundelete — Recreating Deleted Stub Files” on page 140.

---

## Restoring an Entire File System

If you lose an entire file system, and you attempt to restore backup versions of all your files, including those that are migrated and premigrated, your file system could run out of space. If your file system runs out of space during the restore process, HSM must begin migrating files to ADSM storage to make room for additional restored files, thus slowing the restore process.

Instead of restoring backup versions of all your files, you can do one of the following:

- If the backup versions and migrated files reside on the same ADSM server, use the RESTORE command with the RESTOREMIGSTATE option set to Yes.

ADSM restores backup versions of resident files, and restores migrated and premigrated files to stub files.

- If the backup versions and migrated files reside on different ADSM servers, or if there are no backup versions of migrated and premigrated files available, use the **dsmmigundelete** command to recreate stub files for migrated and premigrated files.

**Note:** When you restore an entire file system, you must perform this task *before* restoring backup versions of your resident files.

Using one of those methods to restore files allows you to return a file system to its state as of the last incremental backup (except that premigrated files are changed to a migrated state).

The following sections provide instructions to restore an entire file system.

### Attention

Be sure to issue commands to restore an entire file system in exactly the order given in the following steps. Otherwise, you might not obtain the desired results.

## Backup and Migration Server are the Same

Use these instructions to restore an entire file system if you back up and migrate files to the same server, and backup versions of your migrated and premigrated files are available.

To restore an entire file system to its state as of the last incremental backup, follow these steps:

1. Follow your operating system instructions to reestablish the file system.
2. Mount the file system. For information about mounting file systems, see “Mounting Your File Systems” on page 31.
3. If the `/etc/adsm/SpaceMan/config/dsmmigfstab` file contains an entry for the file system, remove the entry from the file. Also ensure that the file system does not contain the `.SpaceMan` directory. Otherwise, you will not be able to add space management to the file system.
4. Add space management to the file system. For information about adding space management, see “Adding Space Management to Your File Systems” on page 34.
5. Issue the `dsmc restore` command (provided with the ADSM backup-archive client) with the `RESTOREMIGSTATE` option set to Yes.

For example, to restore the `/home` file system, issue:

```
dsmc restore -restoremigstate=yes /home
```

When you use the `RESTOREMIGSTATE=Yes` option with the `dsmc restore` command, ADSM restores backup versions of resident files, and restores stub files for migrated and premigrated files.

## Backup Server and Migration Server are Different

Use these instructions to restore an entire file system if you back up files to one server and migrate them to another, or if backup versions are not available for migrated and premigrated files.

To restore an entire file system to its state as of the last incremental backup, follow these steps:

1. Follow your operating system instructions to reestablish the file system.
2. Mount the file system. For information about mounting file systems, see “Mounting Your File Systems” on page 31.
3. If the `/etc/adsm/SpaceMan/config/dsmmigfstab` file contains an entry for the file system, remove the entry from the file. Also ensure that the file system does not

contain the **.SpaceMan** directory. Otherwise, you will not be able to add space management to the file system.

4. Add space management to the file system. For information about adding space management, see “Adding Space Management to Your File Systems” on page 34.
5. Issue the **dsmc restore** command (provided with the ADSM backup-archive client) with the DIRONLY option to restore the directory structure of the file system.

For example, to restore the directory structure for the **/home** file system, issue:

```
dsmc restore -dironly /home
```

When you use the DIRONLY option with the **dsmc restore** command, ADSM restores only the directories for the file system. It restores only those directories that have been backed up. For each directory, it restores attributes, such as access permissions or, on an AIX workstation, an access control list.

6. Issue the **dsmmigundelete** command to recreate stub files for migrated files and to create stub files for premigrated files.

For example, to recreate stub files for all migrated files and to create stub files for all premigrated files in the **/home** file system that have *not* been marked for expiration on the ADSM server, issue:

```
dsmmigundelete /home
```

**Note:** When you are restoring an entire file system, do not use the EXPIRING option with the **dsmmigundelete** command unless you want to create stub files for all migrated and premigrated files, regardless of whether the files have been marked for expiration. If you use the EXPIRING option, you could create stub files for migrated or premigrated files that were intentionally deleted from the local file system prior to the problem that caused you to lose the entire file system.

For more information about the **dsmmigundelete** command, see “dsmmigundelete — Recreating Deleted Stub Files” on page 140.

7. Issue the **dsmc restore** command with the REPLACE=NO option to restore backup versions of previously resident files.

For example, to restore backup versions of all the remaining files in the **/home** file system, issue:

```
dsmc restore -replace=no /home
```

**Note:** ADSM restores hard links during the restore process if the hard links were backed up.

---

## Restoring a Disk in Case of Disk Loss

To restore your disk in case of disk loss, you must restore your:

- Operating system
- Communications software
- ADSM backup-archive client
- ADSM HSM client
- File systems

## Restoring Your System

ADSM can recover your files only if you can run the ADSM backup-archive client. It can recreate stub files for migrated files and create stub files for premigrated files only if you can run the ADSM HSM client. If the file system that contains your ADSM clients is lost (from theft or hardware failure, for example), you must reinstall the ADSM clients before you can recover your files. If you also lose the file system that contains the operating system and communications software, you must recover them before you can connect to your ADSM server.

To protect yourself against these kinds of losses, you need to put together a set of installation media that you can use to restore your system to a state that permits you to contact the ADSM server and begin recovering data. The installation media should contain:

1. A bootable operating system that will allow you to perform basic functions.
2. A correctly configured communications program that will allow you to establish communications with the ADSM server.
3. An ADSM backup-archive client and an ADSM HSM client with appropriately customized options files. Command-line clients are sufficient.

The exact files you need differ depending on the communications package you use. Consult your operating system and communications software manuals for help in setting up your installation media.

## Restoring Your File Systems

### Attention

Be sure to issue commands to restore your file systems in exactly the order given in the following steps. Otherwise, you might not obtain the desired results.

### Backup Server and Migration Server are the Same

Use these instructions to restore your file systems if you back up and migrate files to the same server.

After you reinstall the ADSM backup-archive client and the HSM client, follow these steps:

1. Follow your operating system instructions to reestablish your native file systems.
2. Mount each file system you want to restore. For information about mounting file systems, see “Mounting Your File Systems” on page 31.
3. Add space management to each file system that was previously managed by HSM. For information about adding space management, see “Adding Space Management to Your File Systems” on page 34.
4. Issue the **dsmc restore** command (provided with the ADSM backup-archive client) with the **RESTOREMIGSTATE** option set to Yes. You can perform this step for one or more file systems at a time.

For example, to restore the **/home** file system, issue:

```
dsmc restore -restoremigstate=yes /home
```

ADSM restores backup versions of resident files and stub files for migrated and premigrated files.

### Backup Server and Migration Server are Different

If you back up files to one server and migrate them to another, follow these steps to restore your file systems.

After you reinstall the ADSM backup-archive client and the HSM client, follow these steps:

1. Follow your operating system instructions to reestablish your native file systems.
2. Mount each file system you want to restore. For information about mounting file systems, see “Mounting Your File Systems” on page 31.
3. Add space management to each file system that was previously managed by HSM. For information about adding space management, see “Adding Space Management to Your File Systems” on page 34.
4. Issue the **dsmc restore** command (provided with the ADSM backup-archive client) with the DIRONLY option to restore the directory structure of each file system. You can perform this step for one or more file systems at a time.

For example, to restore the directory structure for the **/home** file system, issue:

```
dsmc restore -dirsonly /home
```

When you use the DIRONLY option with the **dsmc restore** command, ADSM restores only the directories for the file systems you specify. It restores only those directories that have been backed up. For each directory, it restores attributes, such as access permissions or, on an AIX workstation, an access control list.

5. Issue the **dsmmigundelete** command to recreate stub files for migrated files and to create stub files for premigrated files for each file system for which you have restored the directory structure. (If you issue the **dsmmigundelete** command without a file system specification, the default is all file systems for which space management is active. Space management is automatically activated for a file system when you add space management to it.)

For example, to recreate stub files for all migrated files and to create stub files for all premigrated files in the **/home** file system that have *not* been marked for expiration on the ADSM server, issue:

```
dsmmigundelete /home
```

**Note:** When you are restoring an entire file system, do not use the EXPIRING option with the **dsmmigundelete** command unless you want to create stub files for all migrated and premigrated files, regardless of whether the files have been marked for expiration. If you use the EXPIRING option, you could create stub files for migrated or premigrated files that were intentionally deleted from the local file system prior to the problem that caused you to lose the entire file system.

For more information about the **dsmmigundelete** command, see “dsmmigundelete — Recreating Deleted Stub Files” on page 140.

6. Issue the **dsmc restore** command with the REPLACE=NO option to restore backup versions of previously resident files.

For example, to restore backup versions of all the remaining files in the **/home** file system, issue:

```
dsmc restore -replace=no /home
```

**Note:** ADSM restores hard links during the restore process if the hard links were backed up.





---

## Chapter 7. Archiving and Retrieving Migrated and Premigrated Files

You can archive a file to save a copy of the file as it exists at a particular point in time or to place a copy of the file in long-term storage. Then, you can retrieve the copy of the file whenever you need it back on your local file system.

Using the ADSM backup-archive client, you can archive and retrieve a copy of a migrated or premigrated file in the same way as you archive and retrieve a copy of a file that resides only on a local file system (see *Using the UNIX Backup-Archive Clients* for detailed information about how to archive and retrieve files).

---

### Archiving Migrated Files

If you archive a copy of a migrated file to the same ADSM server to which the file was migrated, ADSM copies the file from the migration destination to the archive destination. It does not recall the file back to your local file system.

If you archive a copy of a migrated file to a different ADSM server than the one to which it was migrated, the ADSM backup-archive client accesses the file using the migrate-on-close recall mode if the recall mode set for the file is normal or migrate-on-close. The file resides on your local file system only until ADSM finishes sending a copy of the file to the archive destination.

If the recall mode set for the file is read-without-recall, the ADSM backup-archive client uses that mode during archive.

If you specify that the file is to be erased from your local file system after a copy of the file is archived, ADSM deletes the stub file from your local file system. The migrated copy of the file remains in ADSM storage until it expires based on the number of days specified with the MIGFILEEXPIRATION option in your client system options file.

If you do not specify that the file is to be erased from the local file system after a copy of the file is archived, the file remains migrated.

---

### Retrieving an Archived Copy of a Migrated File

If you need an archived copy of a migrated file back on your local file system, you can retrieve the copy.

If you retrieve an archived copy of a migrated file back to its original location, the file becomes a resident file. ADSM removes the migrated copy of the file from ADSM storage (if one exists) when it expires based on the number of days specified with the MIGFILEEXPIRATION option in your client system options file.

---

## Archiving and Retrieving Premigrated Files

You can archive and retrieve a copy of a premigrated file in the same way you archive and retrieve a copy of any other file.

If you archive a copy of a premigrated file to the same server to which it was migrated or to a different server, ADSM sends a copy of the file from your local file system to ADSM storage.

If you retrieve an archived copy of a premigrated file to its original location, the file becomes a normal, resident file. ADSM removes the premigrated copy of the file from ADSM storage when it expires based on the number of days specified with the MIGFILEEXPIRATION option in your client system options file.

---

## Chapter 8. Using Commands

ADSM HSM provides commands that you can use instead of the graphical user interface to perform most space management tasks.

This chapter includes general information about using ADSM HSM client commands and a detailed command reference section.

---

### Entering Commands

There are two formats you can use to enter ADSM HSM client commands:

- Standard format—Allows you to enter options with commands in a format similar to ADSM backup-archive client commands as shown in these examples:

```
dsmmigrate -Recursive -Detail /home/user1/file1
dsmmigrate -r -d /home/user1/file1
```

- Short format—Allows you to enter options with commands in a format similar to your operating system commands as shown in this example:

```
dsmmigrate -Rv /home/user1/file1
```

The format you use depends on the setting for the OPTIONFORMAT option in your client user options file. You *must* use the format specified in that file. If you do not specify the OPTIONFORMAT option in your client user options file, the default is STANDARD.

The following sections provide information about using each format.

**Note:** Unlike ADSM backup-archive client commands, you do *not* precede each ADSM HSM client command with **dsmc**. Each HSM client command is a separately-executable command.

### Using the Standard Format

If the OPTIONFORMAT option is set to STANDARD (the default) in your client user options file, you must use the standard format to issue ADSM HSM client commands.

The command entry rules for the standard format are:

- You must enter the entire command name in lowercase letters. You cannot use uppercase letters or an abbreviation for a command name.

For example:

```
dsmmigrate
```

- You can use the following wildcard characters in file, directory, and file system specifications:
  - \* Matches zero or more characters
  - ? Matches any single character

Wildcard characters are matched and expanded by the shell in which you are running.

- You can enter options using the entire option keyword or any acceptable abbreviation. The minimum abbreviation allowed for each option is indicated by uppercase letters in the command reference section of this chapter.

For example, the standard format for the low threshold option of the **dsmmigfs** command is as follows:

**-Lthreshold=*n***

You can enter that option using any abbreviation that begins with the letter L. For example:

```
-l=70  
-lthres=70
```

- You can enter options in any combination of uppercase and lowercase letters. Options are not case sensitive.
- You must precede each option with a hyphen (-). For example:  

```
dsmmigquery -candidatelist -premigratedlist /home
```
- You can enter more than one option in a command in any order before or after a file, directory, or file system specification. For example, you can enter either of the following:  

```
dsmmigrate -recursive -detail /home/user1/test1  
dsmmigrate /home/user1/test1 -detail -recursive
```
- You must separate each option or parameter with a blank space.
- You must enter the characters in a command in a continuous string without using the Return key. The command line allows as many as 256 characters.

## Using the Short Format

If the OPTIONFORMAT option is set to SHORT in your client user options file, you must use the short format to issue ADSM HSM client commands.

As with the standard format:

- You must enter the entire command name in lowercase letters. You cannot use uppercase letters or an abbreviation for a command name.

For example:

```
dsmmigrate
```

- You can use the following wildcard characters in file, directory, and file system specifications:

\* Matches zero or more characters

? Matches any single character

Wildcard characters are matched and expanded by the shell in which you are running.

- You must enter the characters in a command in a continuous string without using the Return key. The command line allows as many as 256 characters.

However, with the short format:

- You must enter options exactly as shown in the command reference section of this chapter. Options are case sensitive.

For example, the short format for the low threshold option of the **dsmmigfs** command is:

`-ln`

You must enter that option exactly as shown with a lowercase letter. For example:

`-l70`

- You must enter any options you want to use in a command *before* you enter a file, directory, or file system specification. You can enter the options in any order.

For example, you can enter either of the following:

```
dsmmigrate -R -v /home/user1/test1
dsmmigrate -v -R /home/user1/test1
```

- You can group multiple options in any order after one hyphen (-) except those that require an argument.

For example:

```
dsmmigrate -Rv /home/user1/file1
```

Or, you can enter a hyphen for each option:

```
dsmmigrate -R -v /home/user1/file1
```

- If you do not group multiple options after one hyphen, you must separate each option or parameter with a blank space.

---

## Displaying Online Help for Commands

You can display online help for all ADSM HSM client commands in one of the following ways:

- By using the **-Help** or **-h** option with any command.

For example, you can enter either of the following:

```
dsmmigrate -help
dsmmigrate -h
```

HSM displays the syntax for the command.

- By using the **dsmmighelp** command.

HSM displays a list of help topics from which you can choose. From that list, you can select general help for commands or detailed help for a specific command.

---

## Hierarchical Storage Management Commands

Figure 38 provides an alphabetical listing of the ADSM HSM client commands with a brief description of each one.

*Figure 38 (Page 1 of 2). HSM Commands*

<b>Command</b>	<b>Description</b>	<b>Reference</b>
dsmattr	Set or display the recall mode for a migrated file	Page 106
dsmautomig	Start threshold migration for a file system	Page 113
dsmdf	Display space usage information for a file system	Page 115
dsmdu	Display space usage information for files and directories	Page 117
dsmls	List files in a directory and show file states	Page 120
dsmmigfs - Add or Update	Add space management to a file system or update space management attributes for a file system	Page 123
dsmmigfs - Deactivate, Reactivate, or Remove	Deactivate or reactivate space management for a file system or remove space management from a file system	Page 129
dsmmigfs - Display	Display current space management settings for a file system	Page 131
dsmmigfs - Globally Deactivate or Reactivate	Deactivate or reactivate space management for your client node	Page 132
dsmmighelp	Display online help for commands	Page 133

Figure 38 (Page 2 of 2). HSM Commands

<b>Command</b>	<b>Description</b>	<b>Reference</b>
dsmmigquery	Display space management information  For a file system, you can display a migration candidates list, a recall list, or a list of all resident, premigrated, and migrated files.  For a client node, you can display information about available management classes or the values set for client and server options.	Page 134
dsmmigrate	Move selected files from a local file system to ADSM storage	Page 138
dsmmigundelete	Recreate deleted stub files	Page 140
dsmmode	Set one or more execution modes that affect the HSM-related behavior of commands	Page 143
dsmmonitord	Start the HSM space monitor daemon	Page 148
dsmq	Display information, including recall IDs, for all files currently queued for recall	Page 149
dsmrecall	Move selected files from ADSM storage back to a local file system	Page 150
dsmrecalld	Start an HSM recall daemon	Page 152
dsmreconcile	Synchronize client and server and build a new migration candidates list for a file system	Page 153
dsmrm	Remove a recall process from the recall queue	Page 156
dsmsetpw	Change the ADSM password for your client node	Page 157

## **dsmattr**

### **dsmattr — Setting or Displaying the Recall Modes for Migrated Files**

Use the **dsmattr** command to set or display the recall mode for one or more migrated files.

The recall mode determines how HSM recalls a migrated file when it is accessed. HSM provides the following recall modes:

- Normal—Recalls the migrated file back to its originating file system.
- Migrate-on-close—Recalls the migrated file back to its originating file system only temporarily. If the file is not modified, HSM returns the file to a migrated state when it is closed.
- Read-without-recall—Reads the migrated file from ADSM storage without storing it back on the local file system.

**Note:** You should not set the recall mode to migrate-on-close or read-without-recall for a file that resides on a file system that has been exported by an NFS server. Because NFS opens and closes a file many times when it is accessed by an NFS client, performance can be severely hampered.

When you use the **dsmattr** command to display the current recall mode for one or more files, HSM displays the recall modes in the Attr field as follows:

–	Indicates the file is not migrated
<b>n</b>	Normal recall mode
<b>m</b>	Migrate-on-close recall mode
<b>r</b>	Read-without-recall mode

**Note:** When you display a list of files using the **dsmls** command, the File State column also indicates the recall mode set for a file.

You can use the **dsmattr** command to set or change the recall mode for a migrated file at any time. You cannot set a recall mode for a resident or premigrated file. The recall mode set for a migrated file remains associated with the file only as long as the file remains migrated.

For example, when you set the recall mode for a migrated file to migrate-on-close, that mode remains associated with the file until you:

- Change the recall mode with the **dsmattr** command
- Access the file with a process that writes to or modifies the file
- Selectively recall the file

In addition, if you accidentally delete the stub file for the migrated file, and you use the **dsmmigundelete** command to recreate it, the recall mode for the file returns to normal.

When you set the recall mode for a migrated file to read-without-recall, that mode remains associated with the file until you:

- Change the recall mode with the **dsmattr** command
- Access the file with a process that writes to or modifies the file



- Open the file with a process that uses memory mapping
- Selectively recall the file
- Recreate the stub file for the migrated file using the **dsmmigundelete** command

In addition, if the file is a binary executable file, and it is executed by a process with execute permission, the mode returns to normal.

You can also set a recall mode for a process to normal or migrate-on-close using the **dsmmode** command. Figure 39 shows the order of precedence for recall modes if the recall mode set for a process is different than the recall mode set for a migrated file that the process accesses.

Figure 39. Order of Precedence for Recall Modes

Order	Recall Mode
1	Read-without-recall
2	Migrate-on-close
3	Normal

For example, if the recall mode set for a migrated file is normal, and the recall mode set for a process that accesses the file is migrate-on-close, HSM uses the migrate-on-close recall mode if possible.

Or, if the recall mode set for a process is normal or migrate-on-close, and the recall mode set for a migrated file it accesses is read-without-recall, HSM uses the read-without-recall mode if possible.

Figure 40 shows which recall mode is used based on the recall mode set for a migrated file, the recall mode set for a process that accesses the file, and the action taken by the process.

Figure 40 (Page 1 of 2). Recall Modes Used

If the recall mode for a migrated file is:	And the recall mode for a process is:	If the process:	HSM uses this recall mode:
Normal	Normal	Does not modify the file	Normal (File becomes pre-migrated)
Normal	Normal	Modifies the file	Normal (File becomes resident)
Normal	Migrate-on-close	Does not modify the file	Migrate-on-close (File returned to migrated state)
Normal	Migrate-on-close	Modifies the file	Normal (File becomes resident)

## dsmattr

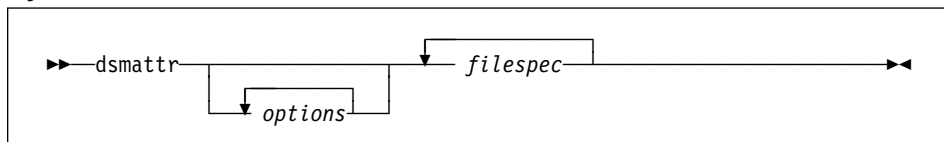
Figure 40 (Page 2 of 2). Recall Modes Used

If the recall mode for a migrated file is:	And the recall mode for a process is:	If the process:	HSM uses this recall mode:
Migrate-on-close	Normal	Does not modify the file	Migrate-on-close (File returned to migrated state)
Migrate-on-close	Normal	Modifies the file	Normal (File becomes resident)
Migrate-on-close	Migrate-on-close	Does not modify the file	Migrate-on-close (File returned to migrated state)
Migrate-on-close	Migrate-on-close	Modifies the file	Normal (File becomes resident)
Read-without-recall	Normal	<ul style="list-style-type: none"> <li>Does not modify the file</li> <li>Does not use memory mapping</li> <li>Does not execute the file and the file is a binary executable file</li> </ul>	Read-without-recall (File remains migrated)
Read-without-recall	Normal	<ul style="list-style-type: none"> <li>Modifies the file</li> <li>Uses memory mapping</li> <li>Executes the file and the file is a binary executable file</li> </ul>	Normal (If modified, file becomes resident; if not modified, file becomes premigrated)
Read-without-recall	Migrate-on-close	<ul style="list-style-type: none"> <li>Does not modify the file</li> <li>Does not use memory mapping</li> <li>Does not execute the file and the file is a binary executable file</li> </ul>	Read-without-recall (File remains migrated)
Read-without-recall	Migrate-on-close	<ul style="list-style-type: none"> <li>Uses memory mapping</li> <li>Executes the file and the file is a binary executable file</li> </ul>	Migrate-on-close (File returned to migrated state)
Read-without-recall	Migrate-on-close	Modifies the file	Normal (File becomes resident)

## dsmattr

**Note:** Keep in mind that a file can be accessed by more than one process at a time. Another process can cause a file you are accessing in migrate-on-close or read-without-recall mode to remain on your local file system as a resident or premigrated file. For example, if the recall mode set for a migrated file is normal, and you access it with a process using the migrate-on-close recall mode and do not modify the file, you would expect the file to be in a migrated state when you close it. But if someone else accesses the file at the same time with a process using normal recall mode or with a process that modifies the file in some way, the file remains on your local file system as either a resident or premigrated file, depending on the actions taken by the other process.

### Syntax



### Parameters

#### *options*

You can use one or both of the following options. If you do not use the **-RECALLmode** option, HSM displays the current recall mode for the specified file or files.

**-RECALLmode=value or -rvalue**

Indicates the recall mode to set for one or more migrated files.

The values you can specify are:

#### **Normal or n**

Sets the recall mode for a migrated file to normal.

When the migrated file is accessed, ADSM copies it back to its originating file system. If the file is not modified, it becomes a premigrated file. If the file is modified, it becomes a resident file.

Normal is the default recall mode for a migrated file.

Note, however, that if the migrated file is accessed by one or more processes and *all* of those processes are using the migrate-on-close recall mode and do not modify the file, HSM uses the migrate-on-close recall mode.

#### **Migonclose or m**

Sets the recall mode for a migrated file to migrate-on-close.

When the migrated file is accessed, HSM copies it back to the local file system temporarily. If the file is not modified, HSM returns the file to a migrated state (by replacing the file with a stub file on the local file system) when it is closed.

## **dsmattr**

If the file is accessed by multiple processes at one time, HSM returns the file to a migrated state only if *all* the processes do not modify the file. If any one process modifies the file, it remains on your local file system as a resident file.

### **Readwithoutrecall** *or* **r**

Sets the recall mode for a migrated file to read-without-recall.

When the migrated file is accessed, HSM reads the file from ADSM storage without storing it back on the local file system. The last piece of information read from the file is cached in a buffer on the local workstation.

If the file is accessed by multiple processes at the same time, HSM reads the file from ADSM storage without storing it on the local file system only if *all* the processes do not modify the file, do not use memory mapping, and do not execute the file if the file is a binary executable file.

If any one process writes to or modifies the file or uses memory mapping, HSM copies the file back to the local file system. If the file is modified, it remains on your local file system as a resident file. If the file is not modified, it remains on your local file system as a premigrated file or is returned to a migrated state, depending on the recall mode used by the process that caused it to be stored on the local file system.

If the file is a binary executable file, HSM recalls the file back to your local file system if a process executes it. The file remains on your local file system as a premigrated file or is returned to a migrated state, depending on the recall mode used by the process that caused it to be stored on the local file system.

**Attention**

The read-without-recall mode is intended to be used for single-access, sequential reads of non-executable files.

Accessing a read-without-recall file with multiple processes at the same time or seeking backward in the file can significantly affect the performance of each process that is accessing the file. Each of those actions can cause the ADSM HSM client to break the connection with the ADSM server and start the read-without-recall process again. Each read process in progress for the file is delayed until the next piece of information it needs is cached in a memory buffer. Only a small portion of a read-without-recall file is cached in a memory buffer to keep the memory overhead of read-without-recall files to a minimum.

In addition, accessing multiple files using the read-without-recall mode could cause contention for resources on the ADSM server.

For example, if a single process opens multiple files, and those files reside on the same sequential media, the process obtains access to only one file at a time. If the process reads, for example, only the first megabyte of data from each file, but leaves the files open for additional reads later, one or more of the reads could time out if the process has been waiting too long, and the ADSM server needs to free resources to perform the next read.

**-RECURsive or -R**

Sets or displays the recall mode for migrated files in the specified directory and all of its subdirectories.

*filespec*

The path and file name of the file for which you want to set a new recall mode or display the current recall mode. You can specify a single file, a group of files, or a directory. If you specify a directory, HSM sets or displays the recall mode you specify for each migrated file in the directory.

**Note:** This parameter is required only when you are setting a new recall mode. If you do not use the **-RECALLmode** option, and you do not specify a path and file name, HSM displays the current recall mode for all files in the current directory.

You can use wildcard characters to specify a group of files with similar names. You can also enter multiple file specifications in one command. If you enter multiple file specifications, be sure to separate each specification with at least one blank space.

**Examples**

**Task:** Change the recall mode for a file named **/home/user1/file1** to migrate-on-close.

**Command:** `dsmattr -recallmode=migonclose /home/user1/file1`

## dsmattr

**Task:** Change the recall mode for all migrated files that begin with JAN in the **/home/user1** directory to read-without-recall.

**Command:** `dsmattr -recallmode=readwithoutrecall /home/user1/JAN*`

or

`dsmattr -rr /home/user1/JAN*`

**Task:** Change the recall mode for all migrated files in the **/home/user1** directory and all of its subdirectories to migrate-on-close.

**Command:** `dsmattr -recallmode=migonclose -recursive /home/user1`

**Task:** Display the recall modes currently assigned to all files in the current directory.

**Command:** `dsmattr`

**Output:**

```
Attr  File Name
/migfs2/test:
<dir> .SpaceMan/
<dir> dir1/
-    tf20
r    tf21
m    tf22
n    tf23
```

## dsmautomig — Starting Threshold Migration

Root User

Use the **dsmautomig** command to start threshold migration manually for one or more file systems.

ADSM starts threshold migration automatically when either of the following occurs:

- Space usage reaches the high threshold specified for a file system
- A file system runs out of space

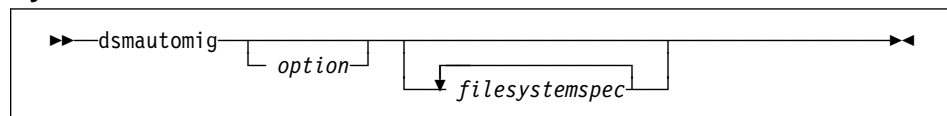
However, you can issue the **dsmautomig** command at any time to start threshold migration manually.

When you issue the **dsmautomig** command, if space usage exceeds the low threshold set for a file system you specify, ADSM begins migrating files to your ADSM server immediately, regardless of whether space usage has reached the high threshold. It stops migrating files when space usage drops to the low threshold.

If no migration candidates list exists for a specified file system, or if the migration candidates list is empty, ADSM runs the reconciliation process before it begins threshold migration.

After threshold migration is complete, ADSM automatically performs premigration based on the premigration percentage set for the file system.

### Syntax



### Parameters

*option*

Specifies the following option.

**-Detail** or **-v**

Displays detailed information about the files that are migrated.

*filesystemspec*

The name of the file system for which you want to run threshold migration. The default is all file systems for which space management is active.

You can specify multiple file system names, and you can use wildcard characters within a file system name. If you specify multiple file system names, be sure to separate each name by at least one blank space.

## **dsmautomig**

### **Examples**

**Task:** Start threshold migration for all file systems for which space management is active.

**Command:** `dsmautomig`

**Task:** Start threshold migration for the **/home** file system.

**Command:** `dsmautomig /home`

**Task:** Start threshold migration for the **/home** and **/test1** file systems.

**Command:** `dsmautomig /home /test1`



## dsmdf — Displaying Space Usage Information for a File System

Use the **dsmdf** command to display the following information for one or more file systems:

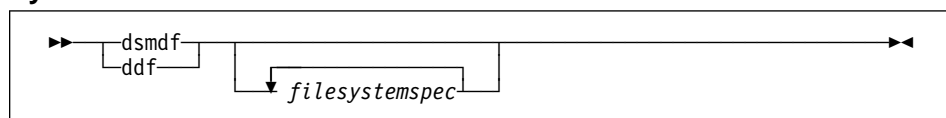
- File system state
- Sum of the sizes of all migrated files
- Amount of space used on the local file system for premigrated files
- Number of inodes used for migrated files
- Number of inodes used for premigrated files
- Number of unused inodes on the local file system
- Amount of free space on the local file system

The file system state can be **a** for active, **i** for inactive, or **gi** for global inactive.

**Note:** Only migration and recall processes update status information for files dynamically. If the state of a file is changed by any other process, the change is not reflected in the information displayed by the **dsmdf** command until reconciliation is run.

For example, if you restore a backup version of a migrated file, the file becomes resident, but the sum of the sizes of all migrated files and the number of inodes used for migrated files are not updated until reconciliation is run. Or, if you use the **touch** command or any other command that changes the ctime for a premigrated file, the file becomes resident, but the amount of space used on the local file system for premigrated files and the number of inodes used for premigrated files are not updated until reconciliation is run.

### Syntax



### Parameters

*filesystemspec*

The name of the file system for which you want to display information. The default is all file systems to which space management has been added.

You can specify multiple file system names, and you can use wildcard characters within a file system name. If you specify multiple file system names, be sure to separate each name with at least one blank space.

### Examples

**Task:** Display information for all file systems to which space management has been added.

**Command:** dsmdf

## dsmdf

### Output:

FSM Filesystem	FS State	Mgrtd KB	Pmgrtd KB	Mgrtd Files	Pmgrtd Files	Unused Inodes	Free KB
/home	a	1620	1032	3	1	972	374
/migfs1	a	20	0	1	0	1926	495
/migfs2	i	0	0	0	0	997	508

**Task:** Display information for the **/home** file system.

**Command:** dsmdf /home

### Output:

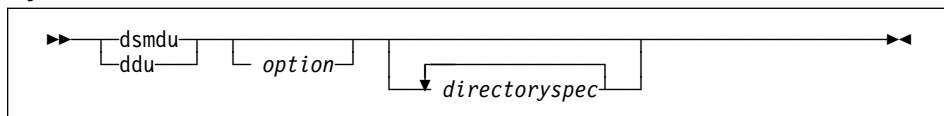
FSM Filesystem	FS State	Mgrtd KB	Pmgrtd KB	Mgrtd Files	Pmgrtd Files	Unused Inodes	Free KB
/home	a	1620	1032	3	1	972	374

## dsmdu — Displaying Space Usage Information for Files and Directories

Use the **dsmdu** command to display space usage information for files and directories.

For migrated files, the **dsmdu** command uses the actual size of the files stored in ADSM storage to calculate space usage. Contrast that with the **du** command (provided with your operating system), which uses the size of the stub files stored in the local file system.

### Syntax



### Parameters

#### *option*

If you do not specify either of the following options, HSM displays the number of 1-KB blocks used by the specified directory and each of its subdirectories.

#### **-Allfiles** or **-a**

Displays the number of 1-KB blocks used by each file in the specified directory and each of its subdirectories.

#### **-Summary** or **-s**

Displays only the grand total of 1-KB blocks used by the specified directory and its subdirectories.

#### *directoryspec*

The directory for which you want to display information. The default is the current directory and its subdirectories.

You can use wildcard characters to specify more than one directory. You can also enter multiple directory specifications in one command. If you enter multiple directory specifications, be sure to separate each name by at least one blank space.

## dsmdu

### Examples

**Task:** Display space usage information for the current directory and all of its subdirectories.

**Command:** dsmdu

**Output:**

```
4      /migfs1/.SpaceMan/logdir
24     /migfs1/.SpaceMan
264   /migfs1/dir1/dir2/dir3/dir4/dir5
588   /migfs1/dir1/dir2/dir3/dir4
856   /migfs1/dir1/dir2/dir3
1184  /migfs1/dir1/dir2
1508  /migfs1/dir1
4      /migfs1/test1
5914  /migfs1
```

**Task:** Display space usage information for the **/migfs3/test** directory and all of its subdirectories.

**Command:** dsmdu /migfs3/test

**Output:**

```
4      /migfs3/test/.SpaceMan/logdir
12     /migfs3/test/.SpaceMan
380   /migfs3/test/dir1
1348  /migfs3/test
```

## dsmdu

**Task:** Display space usage information for each file in the **/migfs2/test** directory and in all of its subdirectories.

**Command:** `dsmdu -Allfiles /migfs2/test`  
*or*  
`dsmdu -a /migfs2/test`

**Output:**

```
4      /migfs2/test/.SpaceMan/candidates
0      /migfs2/test/.SpaceMan/premigrdb.pag
0      /migfs2/test/.SpaceMan/premigrdb.dir
0      /migfs2/test/.SpaceMan/status
4      /migfs2/test/.SpaceMan/logdir
12     /migfs2/test/.SpaceMan
376    /migfs2/test/tf20
188    /migfs2/test/tf21
374    /migfs2/test/tf22
376    /migfs2/test/dir1/tf00
380    /migfs2/test/dir1
10     /migfs2/test/tf23
1728   /migfs2/test
```

**Task:** Display the total number of 1-KB blocks used by the **/migfs2/test** directory and all of its subdirectories.

**Command:** `dsmdu -Summary /migfs2/test`

**Output:**

```
1728   /migfs2/test
```

## dsmls

### dsmls — Listing Files in a Directory

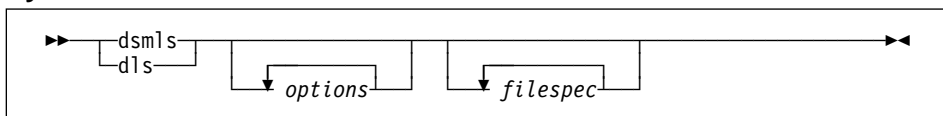
Use the **dsmls** command to display a list of files. The information displayed for each file includes:

- Actual size (in bytes)
- Resident size (in bytes)
- Resident block size (in KB)
- File state and recall mode
- File name

For a resident or premigrated file, the actual size and resident size are the same. For a migrated file, the actual size is the size of the original file, and the resident size is the size of the stub file that remains on the local file system.

The file state for a file can be **m** for migrated, **p** for premigrated, or **r** for resident. A dash (-) indicates a directory or non-regular file (for example, a character special file or a named pipe file). For a migrated file, the **dsmls** command also indicates the recall mode set for the file. If the recall mode is normal, no additional information appears in the File State column. If the recall mode is migrate-on-close, the notation (**m**) appears in the File State column, and if the recall mode is read-without-recall, the notation (**r**) appears in the File State column.

### Syntax



### Parameters

#### *options*

Any of the following options:

#### **-Noheader** or **-n**

Omits column headings from the output for this command.

#### **-Recursive** or **-R**

Displays information about files in subdirectories of the directory.

#### *filespec*

The path name for the files you want to list. The default is all files in the current directory.

You can use wildcard characters to specify a group of files or all the files in a directory. You can also enter multiple file specifications in one command. If you enter multiple file specifications, be sure to separate each specification by at least one blank space.

### Examples

**Task:** List all files in the current directory.

## dsmls

**Command:** dsmls

**Output:**

Actual Size	Resident Size	Resident Blk (KB)	File State	File Name
/migfs1/test:				
<dir>	512	4	-	.SpaceMan/
<dir>	512	4	-	dir1/
18033	18033	20	r	tf12
23	23	4	r	tf13
<dir>	512	4	-	test1/
18033	18033	20	r	tf01
18033	4095	4	m (m)	tf02
18033	4095	4	m (r)	tf03
18033	4095	4	m	tf04
<dir>	512	4	-	test2/
18033	4095	4	m	tf05
18033	4095	4	m	tf06
18033	18033	20	p	tf07
18033	18033	20	p	tf08
18033	18033	20	r	tf09
31908	31908	32	r	tf10

**Task:** List all files in the `/migfs2/test` directory.

**Command:** dsmls /migfs2/test

**Output:**

Actual Size	Resident Size	Resident Blk (KB)	File State	File Name
<dir>	512	4	-	test/
/migfs2/test:				
<dir>	512	4	-	.SpaceMan/
<dir>	512	4	-	dir1/
382896	382896	376	r	tf20
382896	4095	4	m	tf21
765792	4095	4	m	tf22
18033	4095	4	m	tf23

**Task:** List all files in the `/migfs2/test` directory and in its subdirectories.

**Command:** dsmls -Recursive /migfs2/test

## dsmls

### Output:

Actual Size	Resident Size	Resident Blk (KB)	File State	File Name
<dir>	512	4	-	test/
/migfs2/test:				
<dir>	512	4	-	.SpaceMan/
<dir>	512	4	-	dir1/
382896	382896	376	r	tf20
382896	4095	4	m	tf21
765792	4095	4	m	tf22
18033	4095	4	m	tf23
/migfs2/test/.SpaceMan:				
57	57	4	r	candidates
<dir>	512	4	-	logdir/
0	0	0	r	premgrdb.dir
0	0	0	r	premgrdb.pag
35	35	0	-	status
/migfs2/test/.SpaceMan/logdir:				
/migfs2/test/dir1:				
382896	382896	376	r	tf00

**Task:** List all files whose names begin with **tf** in the **/migfs2/test** directory.

**Command:** dsmls /migfs2/test/tf\*

### Output:

Actual Size	Resident Size	Resident Blk (KB)	File State	File Name
382896	382896	376	r	tf20
382896	4095	4	m	tf21
765792	4095	4	m	tf22
18033	4095	4	m	tf23



## dsmmigfs - Adding or Updating Space Management

### dsmmigfs — Adding or Updating Space Management

Root User

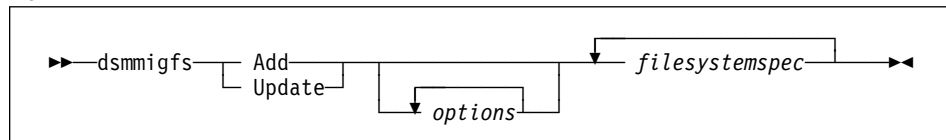
Use the **dsmmigfs** command with the Add or Update keyword to:

- Add space management to a file system
- Update space management settings for a file system

You can add space management to JFS file systems on an AIX workstation.

HSM does not allow you to add space management to your root (*/*) or */tmp* file systems. In addition, you should not add space management to your */usr* or */var* file systems.

#### Syntax



#### Parameters

##### Add

Adds space management to a file system.

**Note:** A file system must be mounted before you can add space management to it.

When you add space management to a file system, HSM does the following:

- Creates a hidden directory named **.SpaceMan** in the file system.

HSM uses that directory to store a migration candidates list for the file system and other information required to perform space management tasks.

- Adds an entry for the file system to the **dsmmigfstab** file stored in the **/etc/adsm/SpaceMan/config** directory.

The entry includes the name of the file system and the space management settings you specify with the options provided for this command.

- Updates mount information for the native file system.

*For a JFS file system (AIX):* If the **/etc/filesystems** file contains a stanza for the file system, HSM does the following:

1. Changes the **mount** attribute from true to false

This prevents the operating system from mounting the file system automatically when the operating system is booted.

2. Adds a **nodename** attribute to the stanza for the file system with a value of - (a dash)

## dsmmigfs - Adding or Updating Space Management

The `nodename` attribute tells the mount command to call the HSM mount helper.

3. Adds an **adsmfsm** attribute to the stanza for the file system with a value of `true`

The **adsmfsm** attribute indicates that the file system is managed by HSM.

*For a UFS file system (Solaris 2.5):* If the **/etc/vfstab** file contains an entry for the file system, ADSM adds a new attribute with a file system type of `fsm`.

- Mounts a file system migrator (FSM) over the native file system.
- Activates space management for the file system.

### Update

Indicates that you want to update one or more space management settings for a file system to which you have added space management.

Use the options provided for this command to update space management settings.

You can update space management settings whether space management is active, inactive, or global inactive for the file system.

If you change the high and low thresholds or the premigration percentage for a file system, the new values take effect immediately.

If you change the stub file size, the new size is used only for files that are migrated after you make the change.

If you change the age or size factor, the new value is used the next time a migration candidates list is built.

If you reduce the quota, and the amount of migrated and premigrated data exceeds the new quota, HSM does not migrate any additional files from the file system until enough files have been recalled during automatic recall or selective recall to drop the total number of megabytes for migrated and premigrated files below the new quota.

### options

Any combination of the following options.

#### **-HThreshold=*n* or -*tn***

A percentage that represents the high threshold for space usage on a file system.

The default for this option is 90.

You can specify an integer from 0 to 100.

When the file system is checked by the space monitor daemon to determine whether threshold migration is required, HSM automatically begins migrating eligible files from the file system to ADSM storage if space usage equals or exceeds the high threshold you specify with this option.

For example, if you specify **-HThreshold=80**, HSM begins migrating eligible files from the file system if 80 percent or more of the space allocated for the file system is used.

## dsmmigfs - Adding or Updating Space Management

**Note:** If the high threshold and low threshold are the same, space usage must exceed the low threshold before threshold migration will start.

### **-Lthreshold=*n* or -*ln***

A percentage that represents the low threshold for space usage on a file system.

The default for this option is 80.

You can specify an integer from 0 to 100. However, the low threshold must be the same as or lower than the percentage you specify for the high threshold.

During threshold or demand migration, HSM automatically stops migrating files from the file system to ADSM storage when space usage drops to the percentage you specify with this option.

For example, if you specify **-Lthreshold=70**, HSM stops migrating files when space usage on the file system drops to 70 percent of the allocated space for the file system.

**Note:** For demand migration, HSM attempts to migrate at least one file, regardless of how much space is used on the file system.

### **-Pmpercentage=*n* or -*pn***

The percentage of space on the file system that you want to contain pre-migrated files that are listed next in the migration candidates list for the file system. If the premigration percentage has not been reached or exceeded, HSM begins premigrating files that are eligible for migration after it completes threshold migration.

The default value for this option is the difference between the percentage specified for the high threshold and the percentage specified for the low threshold. For example, if the high threshold is 90 percent and the low threshold is 80 percent, the premigration percentage is 10.

You can specify an integer from 0 to 100.

If you specify the same percentage for both the high and low thresholds, and you do not change the default for the premigration percentage, HSM does not premigrate any files.

If the default premigration percentage or the percentage you set equals or exceeds the percentage specified for the low threshold, HSM premigrates all remaining files in the file system that are eligible for migration.

### **-Agefactor=*n* or -*gn***

The age factor to assign to all files in the specified file system.

HSM uses the age factor and the size factor to determine the order in which eligible files are migrated to ADSM storage.

To determine priority, HSM multiplies the age of the file (calculated as (current time - atime) / (60 \* 60 \* 24)) by the age factor you specify, and multiplies the size of the file in 1-KB blocks by the size factor you specify. Then, it adds the two products to produce a priority score for the file.

## dsmmigfs - Adding or Updating Space Management

HSM migrates eligible files in descending order based on their priority scores.

The default for this option is 1.

You can specify an integer from 0 to 999999999.

If you want HSM to prioritize files for migration only by age, set the age factor to 1 and the size factor to 0.

If you want HSM to prioritize files for migration only by size, set the size factor to 1 and the age factor to 0.

To place more weight on the age of a file, increase the age factor. To place more weight on the size of a file, increase the size factor.

### **-Sizefactor=*n* or -*in***

The size factor to assign to all files in the specified file system.

HSM uses the size factor and the age factor to determine the order in which eligible files are migrated to ADSM storage.

To determine priority, HSM multiplies the age of the file (calculated as (current time - atime) / (60 \* 60 \* 24)) by the age factor you specify, and multiplies the size of the file in 1-KB blocks by the size factor you specify. Then, it adds the two products to produce a priority score for the file.

HSM migrates eligible files in descending order based on their priority scores.

The default for this option is 1.

You can specify an integer from 0 to 999999999.

If you want HSM to prioritize files for migration only by size, set the size factor to 1 and the age factor to 0.

If you want HSM to prioritize files for migration only by age, set the age factor to 1 and the size factor to 0.

To place more weight on the age of a file, increase the age factor. To place more weight on the size of a file, increase the size factor.

### **-Quota=*n* or -*qn***

The maximum number of megabytes of data that can be migrated and premigrated from the file system to ADSM storage.

The default for this option is the same number of megabytes as allocated for the file system itself. For example, if 200 megabytes are allocated for a file system, HSM can migrate and premigrate files from that file system until the total number of megabytes migrated and premigrated equals 200 megabytes.

You can specify an integer from 0 to 999999999.

If you set the quota to 0, no files can be migrated from the file system to ADSM storage. However, any previously migrated files remain migrated.

### **-Stubsize=*n* or -*sn***

The size of stub files left on your local file system when HSM migrates files to ADSM storage.

## dsmmigfs - Adding or Updating Space Management

The default for this option is the block size defined for a file system.

The values you can specify are:

512, 1, 2, 4, 8, 16, or 32

512 indicates 512 bytes. That is the minimum size you can specify for a stub file. The remaining values are in kilobytes. However, the actual size of a stub file is the value you specify minus one byte. For example, if you specify 512, the size of each stub file is actually 511 bytes. Subtracting one byte from the size of a stub file assists HSM in distinguishing it as a stub file.

If you specify 512, a stub file contains information about the migrated file, including the information necessary to recall it back to your local file system, but does not contain any leading bytes of data from the original file.

Specifying a larger size for stub files allows HSM to store leading bytes of data from migrated files. The larger the value you specify for this option, the more leading bytes of data HSM can store in a stub file. If only that data is accessed and is not updated, HSM does not need to recall the migrated file from ADSM storage.

**Note:** You can choose a stub file size that is smaller than the file system block size. However, that causes inefficient use of space on your file system. Even though HSM uses only the number of bytes you specify for stub files, your operating system still allocates one block for each stub file. The number of bytes in excess of the stub file size you choose are unused.

### *filesystemspec*

The name of the file system for which to perform the specified action.

You can specify multiple file system names, and you can use wildcard characters within a file system name. If you specify multiple file system names, be sure to separate each name by at least one blank space.

### Examples

**Task:** Add space management to the **/home** file system and set the high threshold to 80 percent and the low threshold to 70 percent.

**Command:** `dsmmigfs Add /home -Hthres=80 -Lthres=70`

**Task:** Add space management to multiple file systems and accept default values for all space management settings.

**Command:** `dsmmigfs Add /home /test1 /proj*`

**Task:** Update the space management settings for the **/home** file system as follows:

- Change the high threshold to 80 percent
- Change the low threshold to 70 percent
- Set the size factor to 0 to ensure that the number of days since a file was last accessed is the only determining factor when prioritizing eligible files for migration

## **dsmmigfs - Adding or Updating Space Management**

**Command:** `dsmmigfs Update -Hthres=80 -Lthres=70 -Sizef=0 /home`

*or*

`dsmmigfs Update -t80 -l70 -i0 /home`

## dsmmigfs - Deactivating, Reactivating, or Removing Space Management

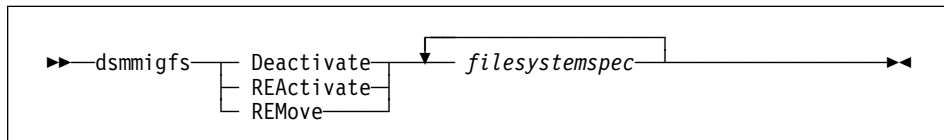
### dsmmigfs — Deactivating, Reactivating, or Removing Space Management

Root User

Use the **dsmmigfs** command with the Deactivate, Reactivate, or Remove keyword to:

- Deactivate space management for a file system
- Reactivate space management for a file system
- Remove space management from a file system

#### Syntax



#### Parameters

##### Deactivate

Deactivates space management for a file system.

When space management is deactivated for a file system, HSM cannot perform migration, recall, or reconciliation for the file system. However, a root user can update space management settings for the file system, and users can access resident and premigrated files.

##### REActivate

Reactivates space management for a file system.

##### REMove

Removes space management from a file system.

If space management is deactivated for the file system, you must reactivate it before you can remove space management.

When you specify this parameter, HSM does the following:

- Runs reconciliation for the file system.

If any orphaned stub files are found, the command fails. Check the **orphan.stubs** file in the **.SpaceMan** directory of the file system for information about each orphaned stub file.

To remove space management, you must resolve all orphaned stub files, and then reissue the **dsmmigfs** command.

- Determines how much space is required on the local file system to recall all migrated files.

If there is not enough space on the local file system to recall all migrated files, the command fails.

## dsmmigfs - Deactivating, Reactivating, or Removing Space Management

To remove space management, you must make enough space available on the local file system to recall all migrated files, and then reissue the **dsmmigfs** command.

- Recalls all migrated files to the local file system.
- Notifies the server to delete all migrated files from ADSM storage.
- Unmounts the file system migrator (FSM) from the file system.
- Removes the entry for the file system from the **dsmmigfstab** file stored in the **/etc/adsm/SpaceMan/config** directory and deletes the **.SpaceMan** directory from the file system.
- Updates information for the native file system.

*For a JFS file system (AIX):* If the **/etc/filesystems** file contains a stanza for the file system, HSM sets the **mount** attribute to true and removes the **nodename** and **adsmfsm** attributes it added when you added space management to the file system.

### *filesystemspec*

The name of the file system for which to perform the specified action.

You can specify multiple file system names, and you can use wildcard characters within a file system name. If you specify multiple file system names, be sure to separate each name by at least one blank space.

### Examples

**Task:** Deactivate space management for the **/home** file system.

**Command:** `dsmmigfs Deactivate /home`

**Task:** Reactivate space management for the **/home** file system.

**Command:** `dsmmigfs REActivate /home`

**Task:** Remove space management from the **/home** file system.

**Command:** `dsmmigfs REMove /home`



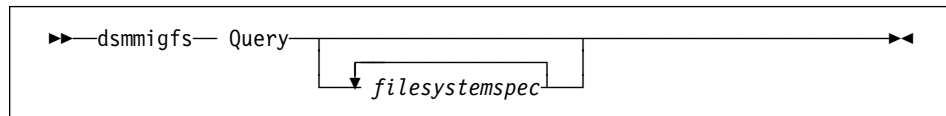
## dsmmigfs - Displaying Space Management Settings

### dsmmigfs — Displaying Space Management Settings

Root User

Use the **dsmmigfs** command with the Query keyword to display the current space management settings for a file system.

#### Syntax



#### Parameters

##### Query

Displays the current space management settings for the specified file system. The settings include values for high and low thresholds, premigration percentage, age and size factors, quota, and stub file size.

A dash (–) in the premigration percentage field or the quota field indicates that the HSM default is being used. For premigration percentage, the default is the difference between the percentage set for the high threshold and the percentage set for the low threshold. For quota, the default is the same number of megabytes as allocated for the file system itself.

##### *filesystemspec*

The name of the file system for which to display current space management settings. The default is all file systems to which space management has been added.

#### Examples

**Task:** Display the current space management settings for the **/migfs2** file system.

**Command:** `dsmmigfs Query /migfs2`

**Output:**

File System Name	High Thrshld	Low Thrshld	Premig Percent	Age Factor	Size Factor	Quota	Stub File Size
/migfs2	90	80	-	1	1	200	4095

## dsmmigfs - Globally Deactivating or Reactivating Space Management

### dsmmigfs — Globally Deactivating or Reactivating Space Management

RootUser

Use the **dsmmigfs** command with the Globaldeactivate or Globalreactivate keyword to:

- Deactivate space management for your client node
- Reactivate space management for your client node

#### Syntax

```
▶▶ dsmmigfs [ GLOBALDeactivate  
GLOBALReactivate ] ▶▶
```

#### Parameters

##### GLOBALDeactivate

Deactivates space management for all file systems on your client node.

When space management is globally deactivated, HSM cannot perform migration, recall, or reconciliation for any file system. However, you can update space management settings for file systems and add space management to additional file systems. Users can access resident and premigrated files.

##### GLOBALReactivate

Reactivates space management for a client node.

When you globally reactivate space management for a client node, all file systems to which space management was previously added return to their previous state. If space management was activated for a file system when you globally deactivated space management, space management is activated for the file system. If space management was deactivated for a file system when you globally deactivated space management, space management is still deactivated for the file system.

If you add space management to a file system while space management is globally deactivated, when you globally reactivate space management, space management is activated for that file system.

#### Examples

**Task:** Globally deactivate space management for your client node.

**Command:** dsmmigfs GLOBALDeactivate

**Task:** Globally reactivate space management for your client node.

**Command:** dsmmigfs GLOBALReactivate

## dsmmighelp — Displaying Online Help for Commands

Use the **dsmmighelp** command to display online help for ADSM HSM commands.

When you issue the **dsmmighelp** command, HSM displays a list of help topics from which you can choose. From that list, you can select general help for commands or detailed information about a specific command. In addition, you can select information about ADSM common messages and HSM messages. You can also display a glossary of HSM terms.

### Syntax

```
▶▶—dsmmighelp————▶▶
```

### Examples

**Task:** Display online help for ADSM HSM commands.

**Command:** dsmmighelp

**Output:**

```
The following help topics are available.
Enter the number of the desired help topic or 'q' to quit,
'd' to scroll down, 'u' to scroll up.
```

```
0 - Using Commands
1 - dsmattr--Set or Display Recall Mode
2 - dsmautomic--Run Threshold Migration
3 - dsmdf--Display Space Usage for File Systems
4 - dsmdu--Display Space Usage for Files/Directories
5 - dsmls--List Files in a Directory
6 - dsmmifgs--Manage File Systems
7 - dsmmighelp--Display Online Help for Commands
8 - dsmmigquery--Display Space Management Info
9 - dsmmigrate--Migrate Selected Files
10 - dsmmigundelete--Recreate Deleted Stub Files
11 - dsmmode--Set or Display Execution Modes
12 - dsmmonitor--Start Space Monitor Daemon
13 - dsmq--Display Status of Recall Processes
14 - dsmrecall--Recall Selected Files
15 - dsmrecalld -- Start a Recall Daemon
16 - dsmreconcile--Reconcile a File System
17 - dsrm--Remove a Recall Process from the Queue
18 - dsmsetpw--Change Your ADSM Password
```

## dsmmigquery

### dsmmigquery — Displaying Space Management Information

Use the **dsmmigquery** command to display the following lists of information for one or more file systems:

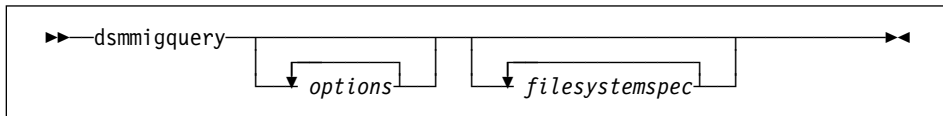
- Migration candidates list
- Ordered recall list for migrated files
- List of all files in the file system

Output from this command is directed to **stdout**. You can redirect the output to a file by using redirection characters and a file name at the end of the command.

You can also use the **dsmmigquery** command to display the following:

- Information about available management classes
- Information about current client and server options

### Syntax



### Parameters

#### *options*

Any of the following options:

#### **-Candidatelist** *or* **-c**

Displays the current prioritized list of migration candidates for the file system. This is the default option for this command.

#### **-SORTEDMigrated** *or* **-m**

Displays a list of all files that have been migrated from the file system to ADSM storage. The files are listed in the most efficient order for recall.

#### **-SORTEDAll** *or* **-s**

Displays a list of all files in the file system. Resident and premigrated files are listed first, followed by migrated files. Migrated files are sorted in the most efficient order for recall.

#### **-Mgmtclass** *or* **-g**

Displays information about each management class you can assign to your files.

#### **-Detail** *or* **-v**

When used with the **-Mgmtclass** option, displays detailed information about each available management class. If you do not use this option, HSM displays only the management class name and a brief description.

The space management attributes displayed are:

## dsmmigquery

### Space Management Technique

The value for this attribute can be one of the following:

- Automatic** Specifies that a file is eligible for the following:
- Automatic migration
  - Selective migration
- Selective** Specifies that a file is eligible for selective migration only.
- None** Specifies that a file is not eligible for migration.

### Auto Migrate on Non-usage

The number of days that must elapse since a file was last accessed before it is eligible for automatic migration. The value for this attribute can be 0 to 9999.

### Backup Required Before Migration

Indicates whether a current backup version of a file (created using the ADSM backup-archive client) must exist on your migration server before the file is eligible for automatic or selective migration. The value for this attribute can be Yes or No.

**Attention:** If this attribute is set to Yes in the management class assigned to a file, ADSM checks for a current backup version of the file only on your migration server. If a current backup version does not exist on your migration server, the file is not migrated, even if a current backup version exists on another server.

### Destination for Migrated Files

The name of the ADSM storage pool where the file is stored when it is migrated.

### -Options or -o

Displays the current settings for client and server options.

### *filesystemspec*

The file system for which you want to display information. The default is the current directory.

You can specify multiple file system names, and you can use wildcard characters within a file system name. If you specify multiple file system names, be sure to separate each name by at least one blank space.

## Examples

**Task:** Display a migration candidates list for the **/migfs1** file system.

**Command:** `dsmmigquery /migfs1`

**Output:**

## dsmmigquery

Priority	Score	Size	Age	File Name
1501		1531584	6	tf25
753		765792	6	tf24
753		765792	6	tf22
379		382896	6	tf21
379		382896	6	tf23
45		31908	14	dir1/tf15
45		31908	14	dir1/tf16
45		31908	14	dir1/tf17
45		31908	14	dir1/dir2/dir3/dir4/tf12
45		31908	14	dir1/dir2/dir3/dir4/tf11
45		31908	14	dir1/dir2/tf10
45		31908	14	dir1/dir2/tf11
45		31908	14	dir1/dir2/tf12

**Task:** Display detailed information about the management classes a root user can assign to the files on your client node.

**Command:** `dsmmigquery -Mgmtclass -Detail`

*or*

`dsmmigquery -gv`

## dsmmigquery

### Output:

```
Session established with server ADSM: AIX-RS/6000
Server Version 2, Release 1, Level 0.0
Server date/time: 02/21/1995 11:48:47 Last access: 02/21/1995 11:46:00

Domain Name           : STANDARD
Activated Policy Set Name : STANDARD
Activation date/time   : 01/19/1995 18:17:35
Default Mgmt Class Name : STANDARD
Grace Period Backup Retn. : 30 day(s)
Grace Period Archive Retn.: 365 day(s)

MgmtClass Name       : STANDARD
Description          : Installed default management class.
Space Management Technique : Automatic
Auto Migrate on Non-Usage : 0
Backup Required Before Migration: No
Destination for Migrated Files : SPACEMGPOOL
Copy Group
  Copy Group Name.....: STANDARD
  Copy Type.....: Backup
  Copy Frequency.....: 0 day(s)
  Versions Data Exists...: 2 version(s)
  Versions Data Deleted..: 1 version(s)
  Retain Extra Versions..: 30 day(s)
  Retain Only Version....: 60 day(s)
  Copy Serialization.....: Shared Static
  Copy Mode.....: Modified
  Copy Destination.....: BACKUPPOOL

  Copy Group Name.....: STANDARD
  Copy Type.....: Archive
  Copy Frequency.....: Cmd
  Retain Version.....: 365 day(s)
  Copy Serialization.....: Shared Static
  Copy Mode.....: Absolute
  Copy Destination.....: ARCHIVEPOOL
```

## dsmmigrate

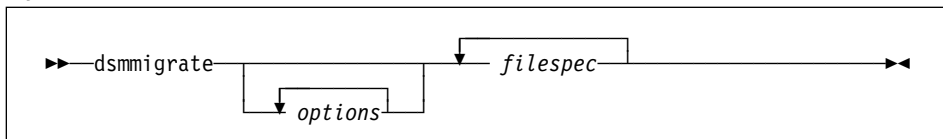
### dsmmigrate — Migrating Selected Files

Use the **dsmmigrate** command to select specific files from a local file system and migrate them to an ADSM server. You can migrate files only from file systems for which space management is active.

If you are a root user, you can selectively migrate any file that is eligible for migration. If you are a user, you can selectively migrate any file you own that is eligible for migration.

**Note:** If the TAPEPROMPT option in your client user options file is set to Yes, and the destination for a migrated file (specified in the management class assigned to the file) is a storage pool that consists of removable media, such as tape, HSM prompts you for whether you want to wait for the medium to be mounted or skip the file.

### Syntax



### Parameters

#### *options*

Any combination of the following options:

#### **-Recursive** *or* **-R**

Migrates files in any subdirectories below the specified directory that match the file specification.

If you do not use this option, HSM migrates files only from the directories you specify.

#### **-Detail** *or* **-v**

Displays the size and file name for each file that is migrated.

#### *filespec*

The path and file name of the file you want to migrate. This parameter is required.

You can use wildcard characters to specify a group of files or all the files in a directory. You can also enter multiple file specifications in one command. If you enter multiple file specifications, be sure to separate each specification with at least one blank space.



## dsmmigrate

### Examples

**Task:** Migrate a file named **tf04** from a directory named **/migfs1/test** and show detailed information.

**Command:** `dsmmigrate -Detail /migfs1/test/tf04`

**Output:**

```
Session established with server ADSM: AIX-RS/6000
Server Version 2, Release 1, Level 0.0
Server date/time: 02/21/1995 12:01:51 Last access: 02/21/1995 11:58:00

Normal File-->          18,033 /migfs1/test/tf04 . Sent
```

**Task:** Migrate all files in a directory named **/migfs2/test/dir1** and in all of its subdirectories and show detailed information.

**Command:** `dsmmigrate -Recursive -Detail /migfs2/test/dir1`

*or*

`dsmmigrate -Rv /migfs2/test/dir1`

**Output:**

```
Session established with server ADSM: AIX-RS/6000
Server Version 2, Release 1, Level 0.0
Server date/time: 02/21/1995 15:44:25 Last access: 02/21/1995 15:44:02

Normal File-->          382,896 /test/migfs2/dir1/tf00 Sent
Normal File-->          382,896 /test/migfs2/dir1/tf01 Sent
Normal File-->          382,896 /test/migfs2/dir1/tf02 Sent
Normal File-->          382,896 /test/migfs2/dir1/tf03 Sent
```

## **dsmmigundelete**

### **dsmmigundelete — Recreating Deleted Stub Files**

RootUser

Use the **dsmmigundelete** command to recreate stub files that were accidentally deleted from a local file system.

When you issue the **dsmmigundelete** command, HSM does the following:

<b>For migrated files</b>	Recreates a stub file for a migrated file if a corresponding stub file does not exist on the local file system.
<b>For premigrated files</b>	Creates a stub file for a premigrated file if a corresponding original file does not exist on the local file system.  The file becomes a migrated file.

The **dsmmigundelete** command can create a stub file for any migrated or premigrated file that has not expired and been removed from ADSM storage.

When a stub file or an original copy of a premigrated file is deleted from a local file system, its corresponding migrated or premigrated file is marked for expiration the next time reconciliation is run.

Reconciliation is run automatically as often as specified with the RECONCILEINTERVAL option in your client system options file. The file expires and is removed from ADSM storage after the number of days specified with the MIGFILEEXPIRATION option in your client system options file.

When you issue the **dsmmigundelete** command:

- A stub file created by the **dsmmigundelete** command contains the information necessary to recall the corresponding file from ADSM storage. It does not contain any leading bytes of data from the file.
- The recall mode (for example, migrate-on-close or read-without-recall) previously set for a migrated file is not stored in a recreated stub file. The recall mode for the file is set to normal.
- If a directory path does not exist in the local file system for a migrated or premigrated file, HSM does not create a stub file for that file.
- HSM recreates a stub file with the name of the file at the time it was migrated. If you rename a file after it is migrated, the file name is not updated on the ADSM server.
- If there are multiple migrated files in ADSM storage that have been marked for expiration and have the same name, HSM recreates a stub file for the file with the most recent modification time (mtime).
- If the name of a migrated or premigrated file in ADSM storage is the same as the name of a file that currently resides on your local file system, HSM replaces the file on your local file system with a stub file only if the modification time for the

## dsmmigundelete

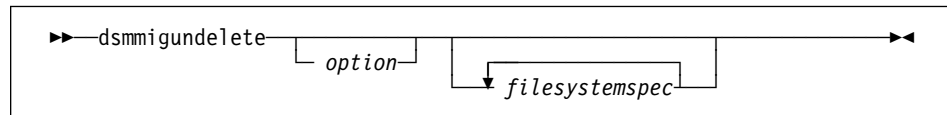
migrated or premigrated file is newer than the modification time for the file on your local file system.

### Attention

The **dsmmigundelete** command does not support hardlinked files. If you attempt to recreate a stub file for a hardlinked file, a stub file is not recreated unless all of the files that are hardlinked together have been deleted from the local file system.

When one file in a set of hardlinked files is migrated, all of the hardlinked files in the set become stub files. When the **dsmmigundelete** command recreates a stub file for a hardlinked file, the stub file has the same name as the file that was originally migrated. Stub files are not recreated for any other files that were previously in the hardlinked set of files.

### Syntax



### Parameters

#### *option*

Specifies the following option.

#### **-Expiring or -e**

Causes HSM to do the following:

**For migrated files** Recreates a stub file for a migrated file if a corresponding stub file does not exist on the local file system, whether the migrated file has been marked for expiration or not.

**For premigrated files** Creates a stub file for a premigrated file if a corresponding original file does not exist on the local file system, whether the premigrated file has been marked for expiration or not.

Use the EXPIRING option if reconciliation has been run since the files were deleted.

If you do *not* use the EXPIRING option, HSM does the following:

**For migrated files** Recreates a stub file for a migrated file if a corresponding stub file does not exist on the local file system, and the migrated file has *not* been marked for expiration.

## **dsmmigundelete**

**For premigrated files**      Creates a stub file for a premigrated file if a corresponding original file does not exist on the local file system, and the premigrated file has *not* been marked for expiration.

You can issue the **dsmmigundelete** command without the EXPIRING option if reconciliation has *not* been run since the files were deleted.

### *filesystemspec*

The name of the file system for which you want to recreate deleted stub files and create stub files for premigrated files that were deleted from the local file system. The default is all file systems for which space management is active.

You can specify multiple file system names. If you specify multiple file system names, be sure to separate each name by at least one blank space.

### **Examples**

**Task:**      Recreate stub files that were accidentally deleted from the **/home** file system for migrated files that are marked for expiration (reconciliation has been run since the files were deleted) and for files that are not marked for expiration.

**Command:**    dsmmigundelete -expiring /home

**Task:**      Recreate stub files for migrated files in the **/home** file system that are *not* marked for expiration (reconciliation has not been run since the files were deleted).

**Command:**    dsmmigundelete /home

## dsmmode — Setting or Displaying Execution Modes

Use the **dsmmode** command to set one or more of the following execution modes to modify the HSM-related behavior of specific commands:

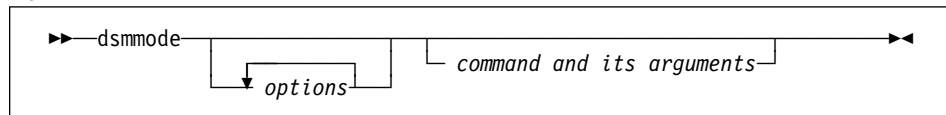
- Data access control mode—Determines whether a migrated file can be accessed.
- Timestamp control mode—Determines whether the access time for a file is set to the current time when the file is accessed. You must have root user authority to change this execution mode.
- Out-of-space protection mode—Determines whether HSM attempts to recover from an out-of-space condition.
- Recall mode—Determines how HSM recalls a migrated file when it is accessed.

You can also use the **dsmmode** command to display the current execution modes in effect.

If you enter the **dsmmode** command, followed by another command and its arguments, the execution mode or modes you specify remain in effect for that command and any child processes of that command only.

If you enter the **dsmmode** command without another command, it starts a new shell, and the execution mode or modes you specify remain in effect until you exit the shell. The shell that is started is the one specified as your default shell in **/etc/passwd**. You can also nest **dsmmode** commands within the new shell.

### Syntax



### Parameters

#### *options*

Any combination of the following options.

If you do *not* specify any options, HSM displays the current execution modes in effect.

#### **-Dataaccess=value or -dvalue**

Determines how a migrated file appears to the next command that is issued.

The values you can specify are:

#### **Normal or n**

A migrated file appears to be resident, and the command is allowed to access the file. This is the default.

#### **Zero-length or z**

A migrated file appears to be a zero-length file.

## dsmmode

### **Error or e**

Any attempt to access a migrated file returns an EIO error.

### **-Timestamp=value or -tvalue**

Root User

Determines whether the access time (atime) for a file is set to the current time when the file is accessed.

This mode can be changed by a root user only. The values you can specify are:

### **Normal or n**

The access time is set to the current time when a file is accessed. This is the default.

### **Preserve or p**

The access time and inode change time (ctime) are not changed when the file is read or its attributes are changed.

For example, you can specify this value to prevent access times from being changed when files are backed up by backup programs other than the ADSM backup-archive client program.

**Note:** If you enter a command, such as the shell command *cat*, then the file you are accessing is mapped into memory. When a file is mapped, the access time will be changed, even if you specify the preserve option.

### **-Outofspace=value or -ovalue**

Determines how HSM responds to out-of-space errors returned by the kernel.

The values you can specify are:

### **Normal or n**

HSM attempts to recover from out-of-space conditions by performing demand migration and avoid returning errors to the user if possible. This is the default.

### **Error or e**

HSM does not intercept out-of-space errors.

### **-Recall=value or -rvalue**

Determines how HSM recalls a migrated file when it is accessed.

The values you can specify are:

### **Normal or n**

When a migrated file is accessed, HSM copies it back to its originating file system. If the file is not modified, it becomes a premigrated file. If the file is modified, it becomes a resident file.

Normal is the default recall mode for a process.

**Migonclose or m**

When a migrated file is accessed, HSM copies it back to the local file system temporarily. If the file is not modified, HSM returns the file to a migrated state (by replacing the file with a stub file on the local file system) when it is closed. If the file is modified, it remains on the local file system as a resident file.

You can also set a recall mode for a migrated file to normal, migrate-on-close, or read-without-recall using the **dsmattr** command.

Figure 41 shows the order of precedence for recall modes if the recall mode set for a process is different than the recall mode set for a migrated file that the process accesses.

*Figure 41. Order of Precedence for Recall Modes*

Order	Recall Mode
1	Read-without-recall
2	Migrate-on-close
3	Normal

For example, if the recall mode set for a migrated file is normal, and the recall mode set for a process that accesses the file is migrate-on-close, HSM uses the migrate-on-close recall mode if possible.

Or, if the recall mode set for a process is normal or migrate-on-close, and the recall mode set for a file it accesses is read-without-recall, HSM uses the read-without-recall mode if possible.

Figure 42 shows which recall mode is used based on the recall mode set for a migrated file, the recall mode set for a process, and the action taken by the process.

*Figure 42 (Page 1 of 2). Recall Modes Used*

If the recall mode for a migrated file is:	And the recall mode for a process is:	If the process:	HSM uses this recall mode:
Normal	Normal	Does not modify the file	Normal (File becomes premigrated)
Normal	Normal	Modifies the file	Normal (File becomes resident)
Normal	Migrate-on-close	Does not modify the file	Migrate-on-close (File returned to migrated state)
Normal	Migrate-on-close	Modifies the file	Normal (File becomes resident)
Migrate-on-close	Normal	Does not modify the file	Migrate-on-close (File returned to migrated state)

## dsmmode

Figure 42 (Page 2 of 2). Recall Modes Used

If the recall mode for a migrated file is:	And the recall mode for a process is:	If the process:	HSM uses this recall mode:
Migrate-on-close	Normal	Modifies the file	Normal (File becomes resident)
Migrate-on-close	Migrate-on-close	Does not modify the file	Migrate-on-close (File returned to migrated state)
Migrate-on-close	Migrate-on-close	Modifies the file	Normal (File becomes resident)
Read-without-recall	Normal	<ul style="list-style-type: none"> <li>Does not modify file</li> <li>Does not use memory mapping</li> <li>Does not execute the file and the file is a binary executable file</li> </ul>	Read-without-recall (File remains migrated)
Read-without-recall	Normal	<ul style="list-style-type: none"> <li>Modifies the file</li> <li>Uses memory mapping</li> <li>Executes the file and the file is a binary executable file</li> </ul>	Normal (If modified, file becomes resident; if not modified, file becomes premigrated)
Read-without-recall	Migrate-on-close	<ul style="list-style-type: none"> <li>Does not modify the file</li> <li>Does not use memory mapping</li> <li>Does not execute the file and the file is a binary executable file</li> </ul>	Read-without-recall (File remains migrated)
Read-without-recall	Migrate-on-close	<ul style="list-style-type: none"> <li>Uses memory mapping</li> <li>Executes the file and the file is a binary executable file</li> </ul>	Migrate-on-close (File returned to migrated state)
Read-without-recall	Migrate-on-close	Modifies the file	Normal (File becomes resident)

**Note:** Keep in mind that a file can be accessed by more than one process at a time. Another process can cause a file you are accessing in migrate-on-close or read-without-recall mode to remain on your local file system as a resident or premigrated file. For example, if the recall mode set for a file is normal, and you access it with a process using the migrate-on-close recall mode and do not modify the file, you would expect the file to be in a migrated state when you close it. But if someone else accesses the file at the same time with a process using normal recall mode or with a process that modifies the file in some way, the file remains on your local file system as either a resident or premigrated file, depending on the actions taken by the other process.

### command

A command (and any of its valid arguments) for which you want the specified execution mode to remain in effect.



## **dsmmode**

If you do not specify a command, HSM starts a new shell. The shell that is started is the one specified as your default shell in **/etc/passwd**. The execution mode you specify remains in effect until you exit the shell.

### **Examples**

**Task:** Display the current execution modes.

**Command:** `dsmmode`

**Task:** Change the data access mode for a **grep** command to ensure that only resident and premigrated files are searched and migrated files are not accessed and recalled.

**Command:** `dsmmode -Dataaccess=Zero-length grep spaceman *`

*or*

`dsmmode -dz grep spaceman *`

## dsmonitor

### dsmonitor — Starting the Space Monitor Daemon

RootUser

Use the **dsmonitor** command to start the HSM space monitor daemon.

The space monitor daemon is started automatically when the first file system to which space management has been added is mounted. However, if the space monitor daemon stops running, you can restart it using this command.

**Note:** If you issue this command, and the space monitor daemon is already running, this command does nothing.

#### Syntax

```
▶▶ dsmonitor ◀◀
```

## dsmq — Displaying the Status of Recall Processes

Use the **dsmq** command to display the following information about each recall process that is queued for processing:

- The recall ID
- The recall daemon process ID
- The start time for the recall process
- The inode number for the file being recalled
- The name of the file system where the file is being recalled
- The original name of the file at the time it was migrated

When you issue the **dsmq** command, ADSM displays information about each recall process for which a recall daemon has been dispatched. If the **MAXRECALLDAEMONS** option in your client system options file is set lower than the current number of recalls requested, some recall requests will not appear in the output for this command until there are recall daemons available to perform the requests.

To remove a recall process from the queue, use the the **dsmrm** command.

**Note:** If the ADSM server is busy or the connection between the ADSM HSM client and the ADSM server is slow, the original name of the file might be temporarily shown as UNKNOWN in the output for this command. You can reissue the **dsmq** command to see the file name.

Also note that if the recall daemon process ID (DPID) is 0, the recall is complete. You cannot remove the recall process from the queue.

### Syntax

```
▶▶ dsmq ◀◀
```

### Examples

**Task:** Display the status of recall processes.

**Command:** `dsmq`

**Output:**

ID	DPID	Start Time	INODE	Filesystem / Original Name
2	21285	15:01:22	23205	</migfs5> </x/test2>
10	22379	15:09:37	2058	</migfs5> </x/large>

## dsmrecall

### dsmrecall — Recalling Selected Files

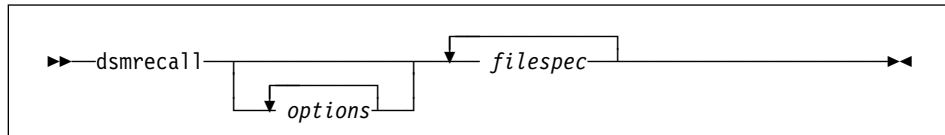
Use the **dsmrecall** command to select migrated files and recall them back to your local file system. You can recall files only for file systems for which space management is active.

If you are a root user, you can selectively recall any file migrated from your workstation. If you are a user, you can selectively recall any file you have permission to access.

If the recall mode set for a migrated file is migrate-on-close or read-without-recall, those modes are overridden when you selectively recall the file. The file is recalled back to its originating file system.

To display a list of all migrated files, use the **dsmmigquery** command. To determine which files in a particular file system or directory are migrated, use the **dsmls** command.

### Syntax



### Parameters

#### *options*

Any combination of the following options:

#### **-Recursive** or **-R**

Recalls files that match the file specification in the directory and its subdirectories.

If you do not use this option, HSM recalls files for only those directories you specify.

#### **-Detail** or **-v**

Displays the size, path, and file name for each file that is recalled.

#### *filespec*

The path and file name of the file you want to recall. This parameter is required.

You can use wildcard characters to specify a group of files or all the files in a directory. You can also enter multiple file specifications in one command. If you enter multiple file specifications, be sure to separate each specification by at least one blank space.

**Note:** When you use wildcard characters in a file specification, HSM attempts to recall all files that match the specification. If a file matches the specification, but is not migrated, HSM displays an error message.

## dsmrecall

### Examples

**Task:** Recall a single file named **/migfs1/test/tf04** and display detailed information.

**Command:** `dsmrecall -Detail /migfs1/test/tf04`

**Output:**

```
Session established with server ADSM: AIX-RS/6000
Server Version 2, Release 1, Level 0.0
Server date/time: 03/02/1995 13:45:20   Last access: 03/02/1995 13:44:40

Recalling          31,908 /migfs1/test/tf04  Done

Recall processing finished.
```

**Task:** Recall all migrated files in a directory named **/home/user1** and all migrated files in its subdirectories.

**Command:** `dsmrecall -Recursive /home/user1/*`

*or*

`dsmrecall -R /home/user1/*`

## dsmrecalld

### dsmrecalld — Starting a Recall Daemon

RootUser

Use the **dsmrecalld** command to start an HSM recall daemon. HSM normally starts a recall daemon automatically whenever a migrated file needs to be recalled from ADSM storage. However, if no recall daemons are running, you can start one yourself using this command.

**Note:** If you issue this command, and a recall daemon is already running, this command does nothing.

#### Syntax

```
▶▶—dsmrecalld—————▶▶
```



## dsmreconcile

- Deletes invalid entries from the premigrated files database.
- Completes the reorganization process if processing was interrupted the last time HSM attempted to reorganize the premigrated files database stored in the **.SpaceMan** directory.
- Clears the database if the premigrated files database is corrupted. All previously premigrated files become resident files.
- Updates the following information in the **status** file:
  - Number of premigrated files
  - Number of blocks premigrated
  - Number of migrated files
  - Number of blocks migrated

### *filesystemspec*

The name of the file system to reconcile. This parameter is optional.

If you do not specify a file system name, HSM reconciles all file systems on your workstation for which space management is active.

You can specify multiple file system names. If you specify multiple file system names, be sure to separate each name by at least one blank space.

### Examples

**Task:** Start reconciliation for all file systems for which space management is active.

**Command:** `dsmreconcile`

**Task:** Start reconciliation for the **/migfs1** file system.

**Command:** `dsmreconcile /migfs1`



## dsmreconcile

### Output:

```
Session established with server ADSM: AIX-RS/6000
Server Version 2, Release 1, Level 0.0
Server date/time: 03/02/1995 13:59:19   Last access: 03/02/1995 13:56:50

Reconciling '/migfs1' filesystem:
  Reading the current premigration database...
    Read 3 entries
  Querying the ADSM server for a list of migrated files...
    Received 77 entries
  Querying the ADSM server for a list of backed up files...
    Received 0 entries
  Now traversing the filesystem...
  Removing the stale pre-migrated DB entries...
    Removed 1 entries
  Expiring migrated files on the server...
    0 files newly marked for expiration
    3 files previously marked for expiration
    3 files exceeded 7 day expiration period; removed from server
  Writing the new migration candidates list...
    Wrote 2 entries
ANS9250I Filesystem '/migfs1' reconciliation completed.
```

**Task:** Start reconciliation for file systems **/home** and **/test1**.

**Command:** `dsmreconcile /home /test1`

**Task:** Build a new migration candidates list for the **/home** file system.

**Command:** `dsmreconcile -CandidateList /home`

*or*

`dsmreconcile -c /home`

## dsmrm

### dsmrm — Removing a Recall Process from the Queue

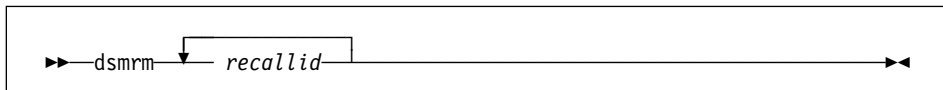
RootUser

Use the **dsmrm** command to remove a recall process from the queue.

To obtain the recall ID required to remove a recall process, use the **dsmq** command.

**Note:** After a recall process has started, the only way you can stop the process is by using this command. You cannot use Ctrl C to stop a recall process.

#### Syntax



#### Parameters

*recallid*

The ID of the recall process you want to remove from the queue.

#### Examples

**Task:** Remove recall ID 10 from the queue.

**Command:** dsmrm 10

**Task:** Remove recall ID 5 and recall ID 6 from the queue.

**Command:** dsmrm 5 6

## dsmsetpw — Changing Your Password

Root User

Use the **dsmsetpw** command to change the ADSM password for your client node.

If a migration server is specified with the MIGRATESERVER option in your client system options file (**dsm.sys**), the password you set with this command applies to that server.

If a default server is specified with the DEFAULTSERVER option in your client system options file, and a migration server is not specified with the MIGRATESERVER option, the password you set applies to the server specified with the DEFAULTSERVER option.

If no migration server or default server is specified using the MIGRATESERVER option or the DEFAULTSERVER option, the password you set applies to the server specified in the first stanza of your client system options file.

ADSM uses the same password for both the ADSM backup-archive client and the ADSM HSM client when both clients contact the same ADSM server. Only one ADSM password is required for each ADSM server your client node contacts for services.

**Note:** To keep your password secure, enter the **dsmsetpw** command without your old password and new password. ADSM will prompt you for each one. When ADSM prompts you for a password, the password you enter does not appear on your screen. In addition, when you allow ADSM to prompt you for your old and new passwords, you eliminate the possibility that they could be displayed by another user who subsequently issues a UNIX **ps** command to display the currently running commands.

ADSM prompts you for the new password twice to verify that you have entered it correctly.

If you have not registered your client node with the ADSM server you are contacting for services, and open registration is in effect, ADSM prompts you for registration information.

### Syntax

```

▶▶ dsmsetpw [ oldpassword newpassword ] ▶▶

```

### Parameters

*oldpassword*

The current ADSM password for your client node.

*newpassword*

The new ADSM password to set for your client node.

## **dsmsetpw**

### **Examples**

**Task:** Change your current ADSM password from **osecret** to **nsecret**.

**Command:** `dsmsetpw osecre t nsecret`

---

## Glossary

The terms in this glossary are defined as they pertain to the ADSM library. If you do not find a term you are looking for, you can refer to the *IBM Dictionary of Computing*, McGraw-Hill, 1994. In the United States and Canada you can order this publication by calling McGraw Hill at 1-800-2MC-GRAW.

This glossary may include terms and definitions from:

- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright (ANSI). Copies may be purchased from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036.
- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC2/SC1).

## A

**active file system.** A file system for which space management is activated. HSM can perform all space management tasks for an active file system, including automatic migration, recall, and reconciliation and selective migration and recall. Contrast with *inactive file system*.

**administrative client.** A program that runs on a file server, workstation, or mainframe. This program allows an ADSM administrator to control and monitor an ADSM server using ADSM administrative commands.

**administrator.** A user who is registered with an ADSM server as an administrator. Administrators are assigned one or more privilege classes that determine which administrative tasks they can perform.

**ADSM.** ADSTAR Distributed Storage Manager

**ADSTAR Distributed Storage Manager. (ADSM).** A client/server program product that provides storage management services to customers in a multivendor computer environment.

**age factor.** A value that determines the weight given to the age of a file when HSM prioritizes eligible files for migration. The age of the file in this case is the number of days since the file was last accessed. The age factor is used with the size factor to determine migration priority for a file. See also *size factor*.

**archive.** The process of copying one or more files to a long-term storage device. When you archive a file, you can specify whether to delete the file from your local file system after it is copied to ADSM storage or leave the original file intact.

**archive copy group.** A policy object that contains attributes that control the generation, destination, and expiration of archived copies of files. An archive copy group is stored in a management class.

**archived copy.** A copy of a file that resides in an ADSM archive storage pool.

**automatic migration.** The process HSM uses to automatically move files from a local file system to ADSM storage based on options and settings chosen by a root user on your workstation. This process is controlled by the space monitor daemon (**dsmonitord**). See also *threshold migration* and *demand migration*.

**automatic reconciliation.** The process HSM uses to reconcile your file systems at regular intervals set by a root user on your workstation. This process is controlled by the space monitor daemon (**dsmonitord**). See also *reconciliation*.

## B

**backup.** The process of copying one or more files to a backup storage pool to protect against data loss.

**backup-archive client.** A program that runs on a file server, PC, or workstation that provides a means for ADSM users to back up, archive, restore, and retrieve files.

**backup copy group.** A policy object that contains attributes which control the generation, destination, and expiration of backup versions of files. A backup copy group is stored in a management class.

## C

**central scheduling.** A function that allows an ADSM administrator to schedule backup, archive, and space management operations from a central location. The operations can be scheduled on a periodic basis or on an explicit date.

**client node.** A file server or workstation on which ADSM has been installed and that has been registered with an ADSM server.

**client polling.** A client/server communication technique where the client node queries the server for scheduled work.

**client/server.** A communications network architecture in which one or more programs (clients) request computing or data services from another program (the server).

**client system options file.** An editable file that contains communication, authorization, central scheduling, backup, archive, and space management options. The options in a client system options file are set by a root user on your workstation. The file name is **dsm.sys** and is stored in your ADSM installation directory.

**client user options file.** A user-editable file that contains options that identify the ADSM server to contact, specify backup, archive, restore, retrieve, and space management options, and set date, time, and number formats. The file name is **dsm.opt** and is stored in your ADSM installation directory.

**copy group.** A policy object that contains attributes which control the generation, destination, and expiration of backup versions of files and archived copies of files. There are two types of copy groups: a backup copy group and an archive copy group. Copy groups are stored in management classes.

## D

**data access control mode.** One of four execution modes provided by the **dsmmode** command. Execution modes allow you to change the space management related behavior of commands that run under **dsmmode**. The data access control mode controls whether a command can access a migrated file, sees a migrated file as zero-length, or receives an input/output error if it attempts to access a migrated file. See also *execution mode*.

**default management class.** The management class ADSM assigns to a file if a root user does not explicitly assign one to a file using an **INCLUDE** option in your include-exclude options file.

**demand migration.** The process HSM uses to respond to an out-of-space condition on a file system. HSM migrates files to ADSM storage until space usage drops to the low threshold set for the file system. If the high threshold and low threshold are the same, HSM attempts to migrate one file.

**destination.** A copy group attribute that specifies the storage pool to which a file is backed up, archived, or migrated. At installation, ADSM provides three storage destinations named **BACKUPPOOL**, **ARCHIVEPOOL**, and **SPACEMGTPOOL**.

**dsm.opt file.** See *client user options file*.

**dsm.sys file.** See *client system options file*.

## E

**exclude.** The process of specifying a file or group of files in your include-exclude options file with an exclude option to prevent them from being backed up or migrated. You can exclude a file from backup and space management, backup only, or space management only.

**execution mode.** A mode that controls the space management related behavior of commands that run under the **dsmmode** command. The **dsmmode** command provides four execution modes — a data access control mode that controls whether a migrated file can be accessed, a time stamp control mode that controls whether the access time for a file is set to the current time when the file is accessed, an out-of-space protection mode that controls whether HSM intercepts an out-of-space condition on a file system, and a recall mode that controls whether a file is stored on your local file system when accessed, or stored on your local file system only while it is being accessed, and then migrated back to ADSM storage when it is closed.

**expiring file.** A migrated or premigrated file that has been marked for expiration and removal from ADSM storage. If a stub file or an original copy of a premigrated file is deleted from a local file system, or if the original copy of a premigrated file is updated, the corresponding migrated or premigrated file is marked for expiration the next time reconciliation is run. It expires and

is removed from ADSM storage after the number of days specified with the MIGFILEEXPIRATION option have elapsed.

## F

**file age.** For migration prioritization purposes, the number of days since a file was last accessed.

**file server.** A dedicated computer and its peripheral storage devices that are connected to a local area network that stores both programs and files that are shared by users on the network.

**file size.** For migration prioritization purposes, the size of a file in 1-KB blocks.

**file state.** The state of a file that resides in a file system to which space management has been added. A file can be in one of three states — resident, premigrated, or migrated. See also *resident file*, *premigrated file*, and *migrated file*.

**file system migrator (FSM).** A kernel extension that is mounted over an operating system file system when space management is added to the file system. The file system migrator intercepts all file system operations and provides any space management support that is required. If no space management support is required, the operation is performed by the operating system file system.

**file system state.** The state of a file system that resides on a workstation on which ADSM HSM is installed. A file system can be in one of these states—native, active, inactive, or global inactive.

**FSM.** File system migrator.

## G

**global inactive state.** The state of all file systems to which space management has been added when space management is globally deactivated for a client node. When space management is globally deactivated, HSM cannot perform migration, recall, or reconciliation. However, a root user can update space management settings and add space management to additional file systems. Users can access resident and premigrated files.

**graphical user interface (GUI).** A type of user interface that takes advantage of a high-resolution monitor,

includes a combination of graphics, the object-action paradigm, and the use of pointing devices, menu bars, overlapping windows, and icons.

**GUI.** Graphical user interface.

## H

**hierarchical storage management client.** A program that runs on a workstation or file server to provide space management services. It automatically migrates eligible files to ADSM storage to maintain specific levels of free space on local file systems, and automatically recalls migrated files when they are accessed. It also allows users to migrate and recall specific files.

**HSM.** Hierarchical Storage Management.

**high threshold.** The percentage of space usage on a local file system at which HSM automatically begins migrating eligible files to ADSM storage. A root user sets this percentage when adding space management to a file system or updating space management settings. Contrast with *low threshold*.

## I

**inactive file system.** A file system for which you have deactivated space management. When space management is deactivated for a file system, HSM cannot perform migration, recall, or reconciliation for the file system. However, a root user can update space management settings for the file system, and users can access resident and premigrated files. Contrast with *active file system*.

**include-exclude options file.** A file, created by a root user on your workstation, that contains include and exclude options. An exclude option can be used to exclude a file from backup and space management, backup only, or space management only. An include option can be used to include specific files for backup and space management and to assign a specific management class to a file.

**inode.** A data structure that describes the individual files in an operating system. There is one inode for each file. The number of inodes in a file system, and therefore the maximum number of files a file system can contain, is set when the file system is created. Hardlinked files share the same inode.

**inode number.** A number that specifies a particular inode in a file system.

## L

**leader data.** Leading bytes of data from a migrated file that are stored in the file's corresponding stub file on the local file system. The amount of leader data stored in a stub file depends on the stub size specified. The required data for a stub file consumes 511 bytes of space. Any remaining space in a stub file is used to store leader data. If a process accesses only the leader data and does not modify that data, HSM does not need to recall the migrated file back to the local file system.

**low threshold.** A percentage of space usage on a local file system at which HSM automatically stops migrating files to ADSM storage during a threshold or demand migration process. A root user sets this percentage when adding space management to a file system or updating space management settings. Contrast with *high threshold*.

## M

**management class.** A policy object that contains a collection of space management attributes and backup and archive copy groups. The space management attributes contained in a management class assigned to a file determine whether the file is eligible for automatic or selective migration. The attributes in the backup and archive copy groups determine whether a file is eligible for incremental backup and specify how ADSM manages backup versions of files and archived copies of files.

**migrate-on-close recall mode.** A mode that causes HSM to recall a migrated file back to its originating file system only temporarily. If the file is not modified, HSM returns the file to a migrated state when it is closed. However, if the file is modified, it becomes a resident file. You can set the recall mode for a migrated file to migrate-on-close by using the **dsmmatr** command, or set the recall mode for a specific execution of a command or series of commands to migrate-on-close by using the **dsmmode** command. Contrast with *normal recall mode* and *read-without-recall recall mode*.

**migrated file.** A file that has been copied from a local file system to ADSM storage and replaced with a stub

file on the local file system. Contrast with *resident file* and *premigrated file*.

**migration.** The process of copying a file from a local file system to ADSM storage and replacing the file with a stub file on the local file system. See also *threshold migration*, *demand migration*, and *selective migration*.

**migration candidates list.** A prioritized list of files that are eligible for automatic migration at the time the list is built. Files are prioritized for migration based on the number of days since they were last accessed, their size, and the age and size factors specified for a file system.

## N

**native file system.** A file system to which you have not added space management.

**normal recall mode.** A mode that causes HSM to copy a migrated file back to its originating file system when it is accessed. If the file is not modified, it becomes a pre-migrated file. If the file is modified, it becomes a resident file. Contrast with *migrate-on-close recall mode* and *read-without-recall recall mode*.

## O

**orphaned stub file.** A stub file for which no migrated file can be found on the ADSM server your client node is currently contacting for space management services. A stub file can become orphaned, for example, if you modify your client system options file to contact a different server for space management than the one to which the file was migrated.

**out-of-space protection mode.** One of four execution modes provided by the **dsmmode** command. Execution modes allow you to change the HSM-related behavior of commands that run under **dsmmode**. The out-of-space protection mode controls whether HSM intercepts out-of-space conditions. See also *execution mode*.

**originating file system.** The file system from which a file was migrated. When a file is recalled using normal or migrate-on-close recall mode, it is always returned to its originating file system.



## P

**premigrated file.** A file that has been copied to ADSM storage, but has not been replaced with a stub file on the local file system. An identical copy of the file resides both on the local file system and in ADSM storage. When free space is needed, HSM verifies that the file has not been modified and replaces the copy on the local file system with a stub file. HSM premigrates files after automatic migration is complete if there are additional files eligible for migration, and the premigration percentage is set to allow premigration. Contrast with *migrated file* and *resident file*.

**premigrated files database.** A database that contains information about each file that has been premigrated to ADSM storage. The database is stored in a hidden directory named **.SpaceMan** in each file system to which space management has been added. HSM updates the premigrated files database whenever it premigrates and recalls files and during reconciliation.

**premigration.** The process of copying files that are eligible for migration to ADSM storage, but leaving the original file intact on the local file system.

**premigration percentage.** A space management setting that controls whether the next eligible candidates in a file system are premigrated following threshold or demand migration. The default for premigration percentage is the difference between the percentage specified for the high threshold and the percentage specified for the low threshold for a file system.

## Q

**quota.** The total number of megabytes of data that can be migrated and premigrated from a file system to ADSM storage. The default for quota is the same number of megabytes as allocated for the file system itself.

## R

**read-without-recall recall mode.** A mode that causes HSM to read a migrated file from ADSM storage without storing it back on the local file system. The last piece of information read from the file is stored in a buffer in memory on the local file system. However, if a process that accesses the file writes to or modifies the file or

uses memory mapping, HSM copies the file back to the local file system. Or, if the migrated file is a binary executable file, and the file is executed, HSM copies the file back to the local file system. You can change the recall mode for a migrated file to read-without-recall by using the **dsmatrr** command. Contrast with *normal recall mode* and *migrate-on-close recall mode*.

**recall.** The process of copying a migrated file from ADSM storage back to its originating file system. See also *transparent recall*, *selective recall*, and *recall mode*.

**recall mode.** 1) One of four execution modes provided by the **dsmmode** command. Execution modes allow you to change the HSM-related behavior of commands that run under **dsmmode**. The recall mode controls whether an unmodified, recalled file is returned to a migrated state when it is closed. 2) A mode assigned to a migrated file with the **dsmatrr** command that determines how the file is processed when it is recalled. It determines whether the file is stored on the local file system, is migrated back to ADSM storage when it is closed, or is read from ADSM storage without storing it on the local file system.

**reconciliation.** The process of synchronizing a file system to which you have added space management with the ADSM server you contact for space management services and building a new migration candidates list for the file system. HSM performs reconciliation automatically at intervals specified with the RECONCILEINTERVAL option in your client system options file. A root user can also start reconciliation manually at any time.

**resident file.** A file that resides on a local file system. It has not been migrated or premigrated, or it has been recalled from ADSM storage and modified. When first created, all files are resident. Contrast with *premigrated file* and *migrated file*.

**restore.** The process of copying a backup version of a file from ADSM storage to a local file system. You can restore a file to its original location or a new location.

**retrieve.** The process of copying an archived copy of a file from ADSM storage to a local file system. You can retrieve a file to its original location or a new location.

## S

**scheduling mode.** A mode that determines whether your client node queries an ADSM server for scheduled work (client-polling) or waits to be contacted by the server when it is time to perform scheduled services (server-prompted).

**selective migration.** The process of copying user-selected files from a local file system to ADSM storage and replacing the files with stub files on the local file system. Contrast with *threshold migration* and *demand migration*.

**selective recall.** The process of copying user-selected files from ADSM storage back to a local file system. Contrast with *transparent recall*.

**server.** A program that runs on a mainframe, workstation, or file server that provides shared services such as backup, archive, and space management to other various (often remote) programs called clients.

**session.** A period of time in which a user can communicate with an ADSM server to perform backup, archive, restore, and retrieve requests, or to perform space management tasks such as migrating and recalling selected files.

**size factor.** A value that determines the weight given to the size of a file when HSM prioritizes eligible files for migration. The size of the file in this case is the size in 1-KB blocks. The size factor is used with the age factor to determine migration priority for a file. See also *age factor*.

**space management.** The process of keeping sufficient free storage space available on a local file system for new data and making the most efficient and economical use of distributed storage resources.

**space management attributes.** Attributes contained in a management class that specify whether automatic migration is allowed for a file, whether selective migration is allowed for a file, how many days must elapse since a file was last accessed before it is eligible for automatic migration, whether a current backup version of a file must exist on your migration server before the file can be migrated, and the ADSM storage pool to which files are migrated.

**space management settings.** Settings that specify the stub file size, quota, age factor, size factor, high threshold, low threshold, and the premigration percentage for a file system. A root user selects space

management settings when adding space management to a file system or when updating space management.

**space monitor daemon.** An ADSM HSM daemon that checks space usage on all file systems for which space management is active, and automatically starts threshold migration when space usage on a file system equals or exceeds its high threshold. How often the space monitor daemon checks space usage is determined by the CHECKTHRESHOLDS option in your client system options file. In addition, the space monitor daemon starts reconciliation for your file systems at the intervals specified with the RECONCILEINTERVAL option in your client system options file.

**storage pool.** A named set of storage volumes that is used as the destination for backup versions of files, archived copies of files, or migrated files.

**stub file.** A file that replaces the original file on a local file system when the file is migrated to ADSM storage. A stub file contains the information necessary to recall a migrated file from ADSM storage. It also contains additional information that HSM can read to eliminate the need to recall a migrated file.

**stub file size.** The size of a file that replaces the original file on a local file system when the file is migrated to ADSM storage. The size specified for stub files determines how much leader data can be stored in the stub file. The default for stub file size is the block size defined for a file system minus 1 byte.

## T

**threshold migration.** The process of moving files from a local file system to ADSM storage based on the high and low thresholds defined for the file system. Threshold migration is started automatically by HSM and can be started manually by a root user. Contrast with *demand migration* and *selective migration*.

**timestamp control mode.** One of four execution modes provided by the **dsmmode** command. Execution modes allow you to change the space management related behavior of commands that run under **dsmmode**. The timestamp control mode controls whether commands preserve the access time for a file or set it to the current time. See also *execution mode*.

**transparent recall.** The process HSM uses to automatically recall a file back to your workstation or file server when the file is accessed. The recall mode set for a file and the recall mode set for a process that accesses the

file determine whether the file is stored back on the local file system, stored back on the local file system only temporarily if it is not modified, or read from ADSM storage without storing it back on the local file system. See also *recall mode*. Contrast with *selective recall*.

## W

**workstation.** A programmable, high-level workstation (usually on a network) with its own processing hardware.



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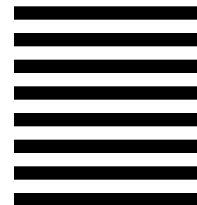
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